IRON & COAL

THE IRON AND COAL TRADES' REVIEW

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LONDON: FRIDAY, MARCH 3, 1961

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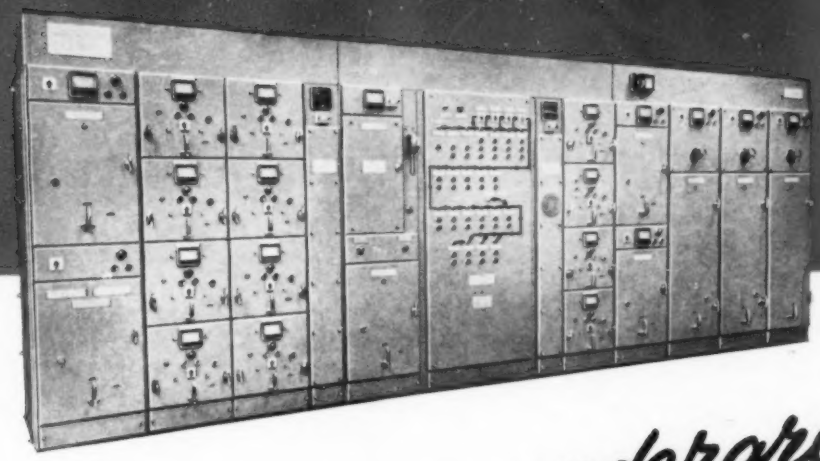

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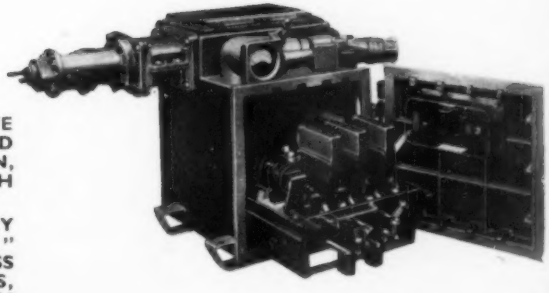

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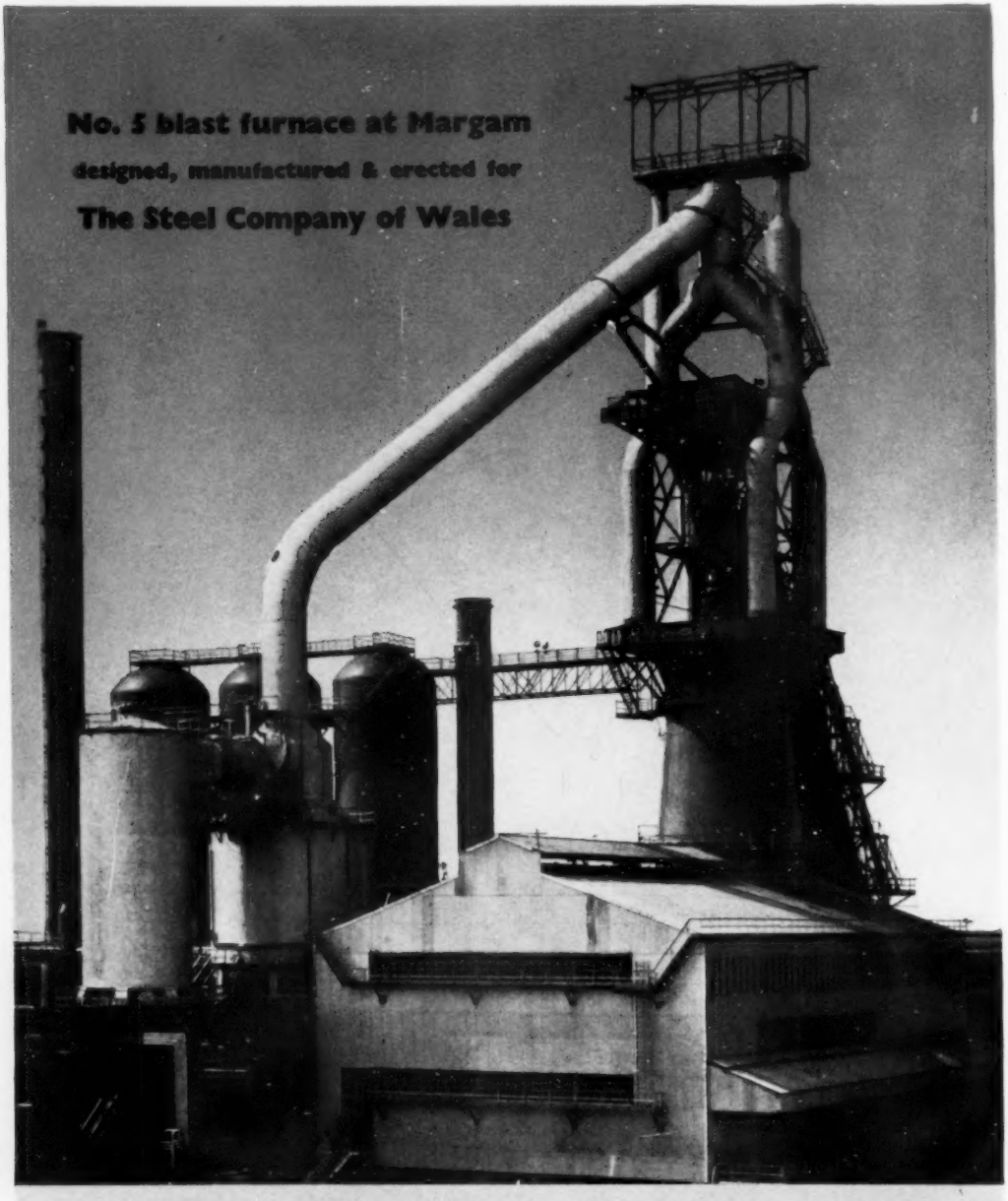

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Iron and Coal
March 3, 1961

ELECTRICALLY CONTROLLED Railway Sidings

by SUMMERSON'S

This sidings contract for the North West Gas Board, Mersey Group, had to be laid without disturbing existing gas production. As Consulting Engineers working with the Gas Board engineers, Summerson's surveyed and designed the layout and drew up a specification. As main contractors, Summerson's manufactured and installed the track which consisted of two different designs. One, involved 8,100 yards of track which included 41 turnouts, 12 tandem turnouts and 3 single cross overs, the other consisted of 765 yards of fully guarded track for fixing in concrete to top rail level, including a scissors cross over and turnouts. The main coke sidings have electro-pneumatically operated switches to direct wagons which move from the tippler tables by gravity, into the correct road. Just another examp'e of how Summerson's experienced "know how" enables a difficult installation to be successfully carried out.

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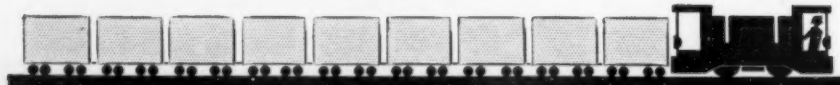
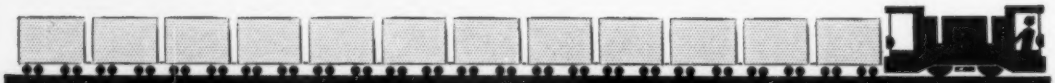


Every battery electric mine loco



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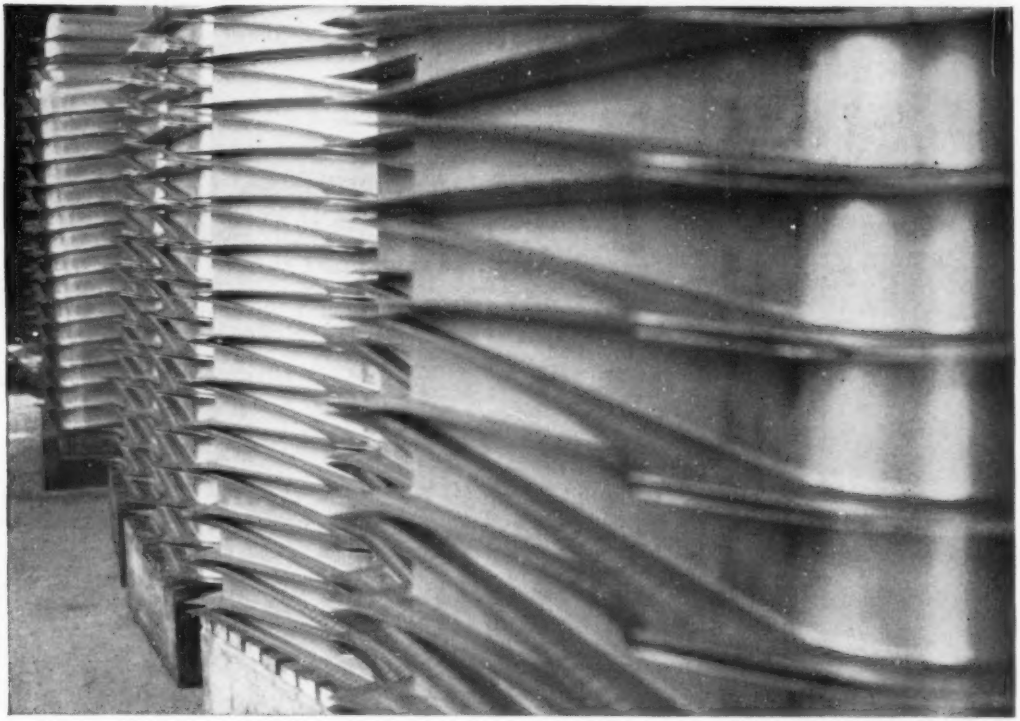

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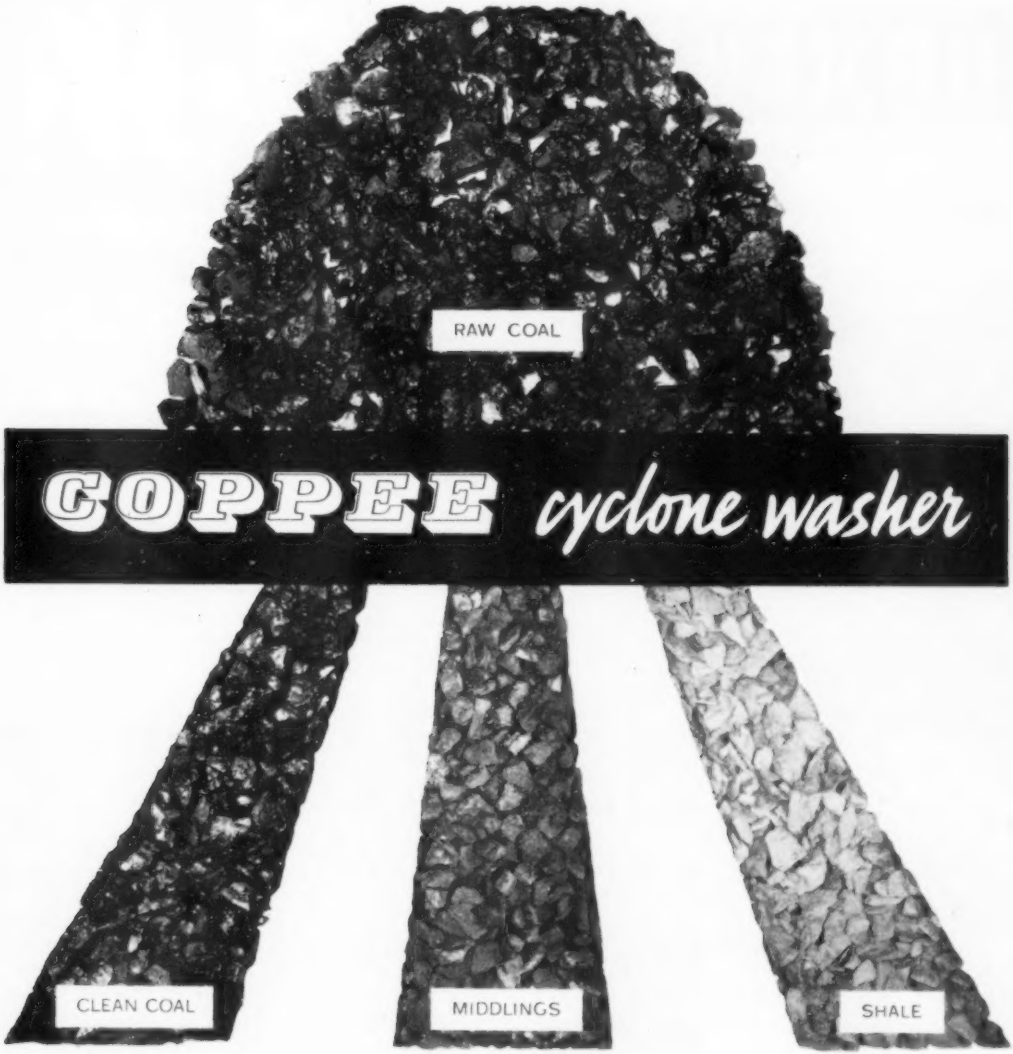

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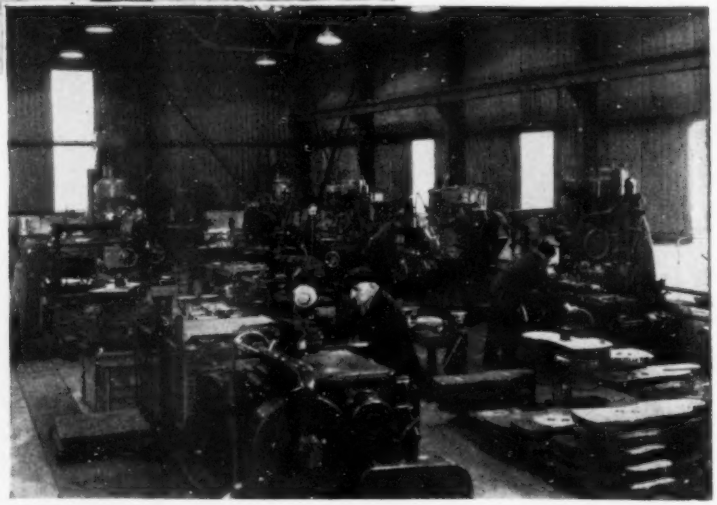

General View of Machine shop—

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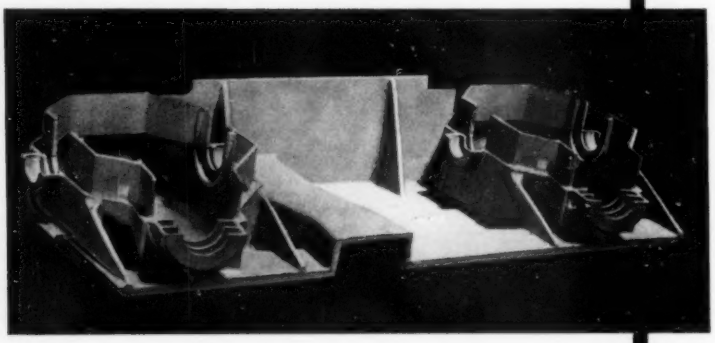
CASTINGS



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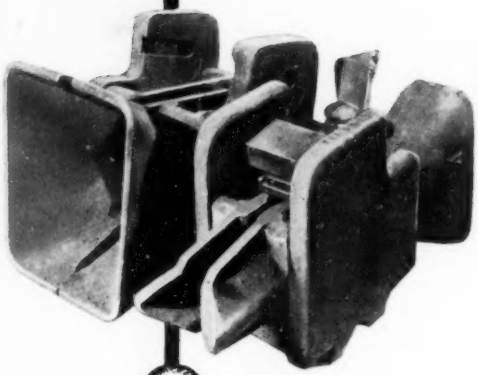

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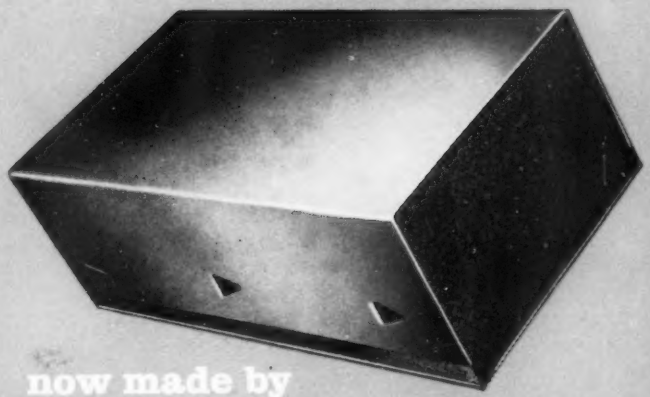

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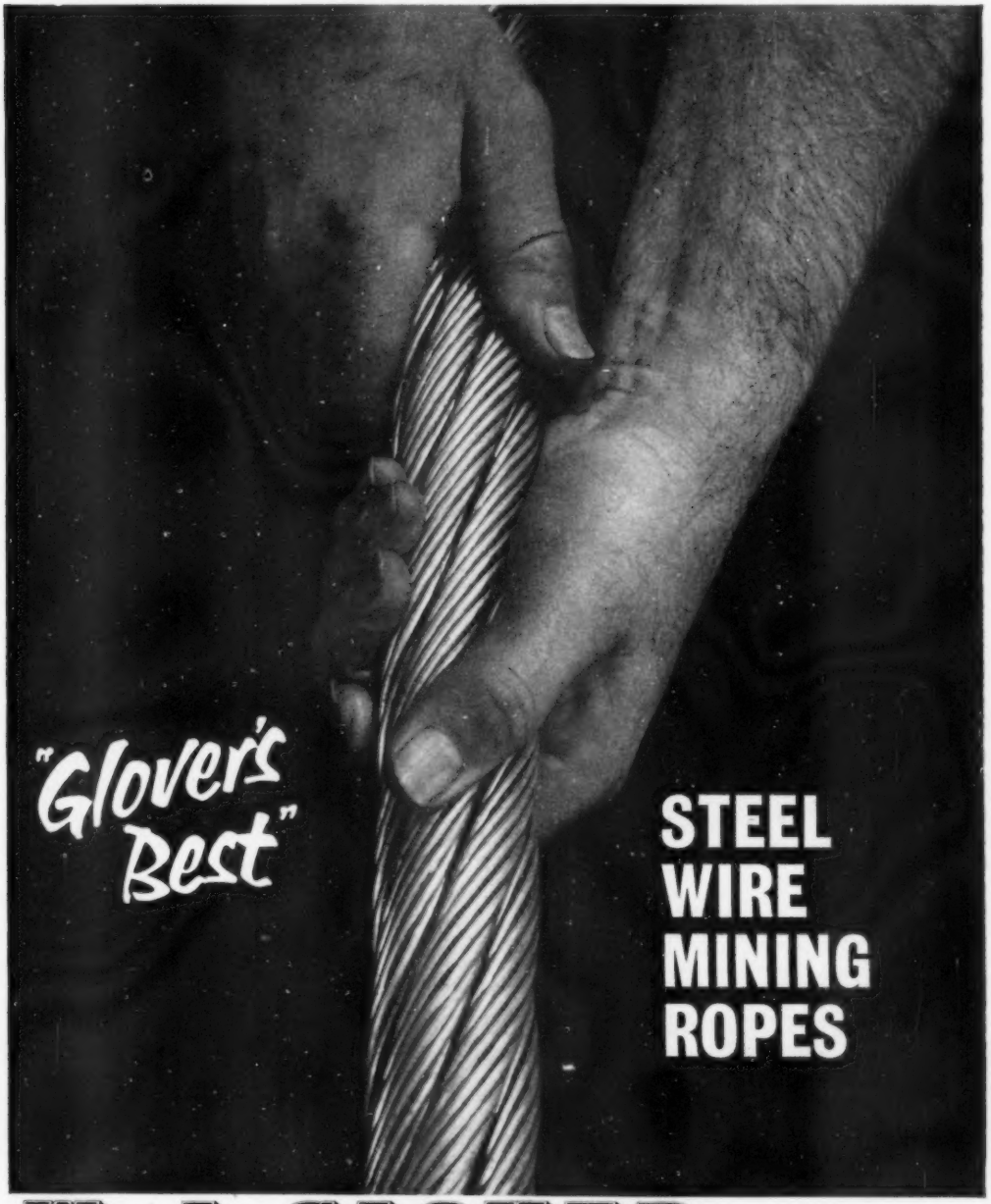

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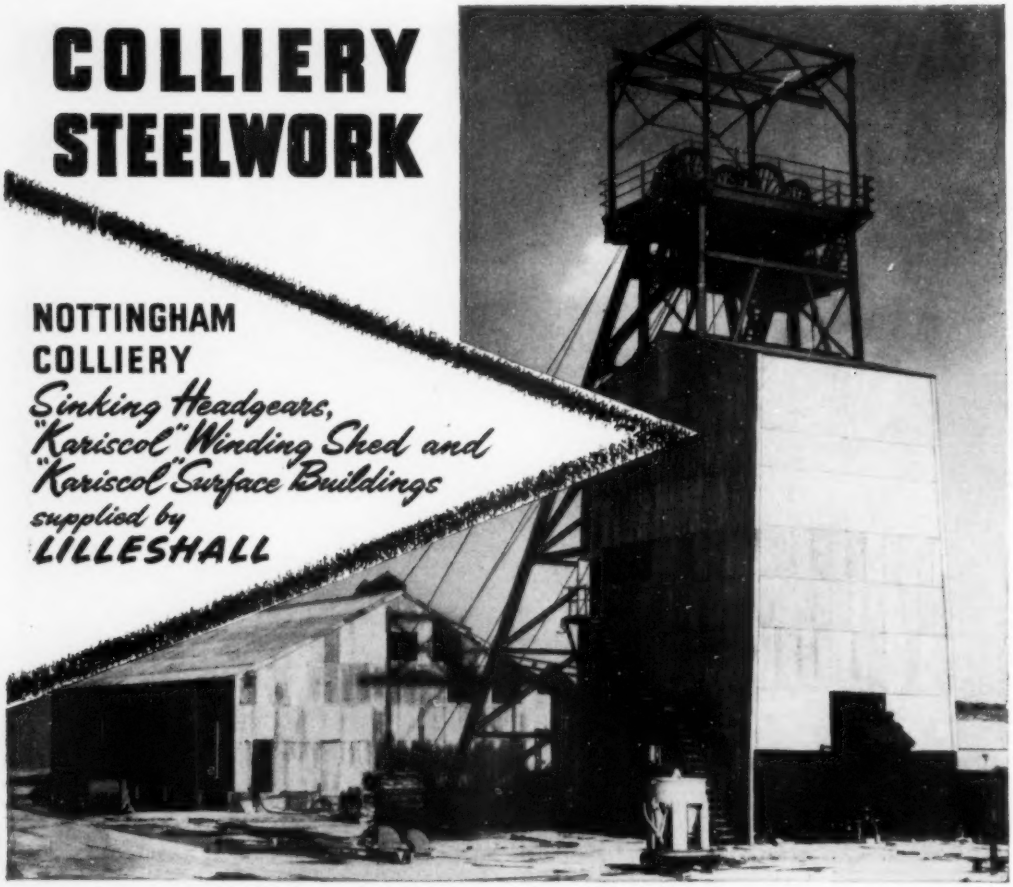

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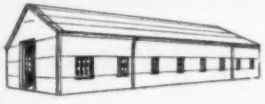

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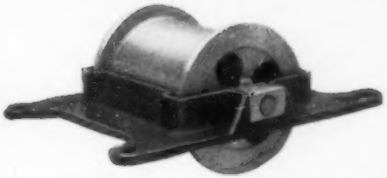

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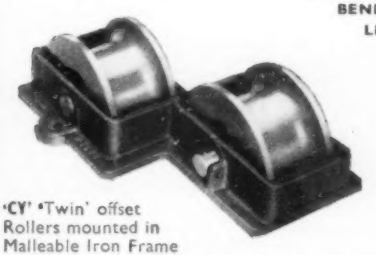

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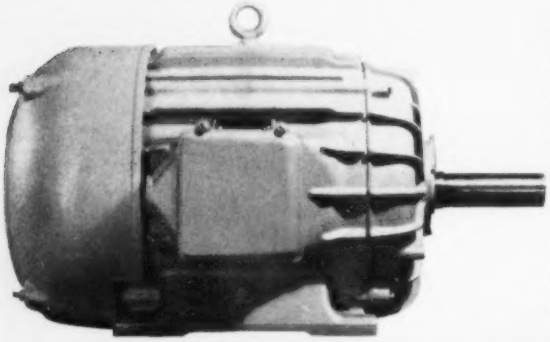

Engineers use the word performance in two senses, a limited one which refers to parameters that can be specified and checked, and a wider, vaguer, but essentially more realistic sense which covers reliability, freedom from trouble, ease of servicing, ready adaptability and many other things. Performance in the first sense is reproducable by any competent manufacturer; it depends on designing to well established principles. Performance in the second sense is the basis of choice between manufacturers. It comes from countless small differences in design that are based on...

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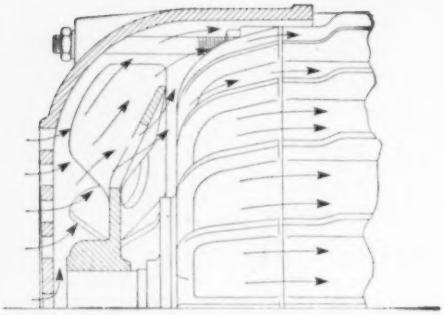

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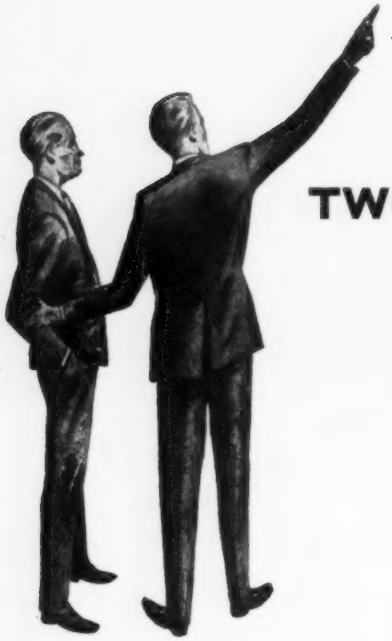

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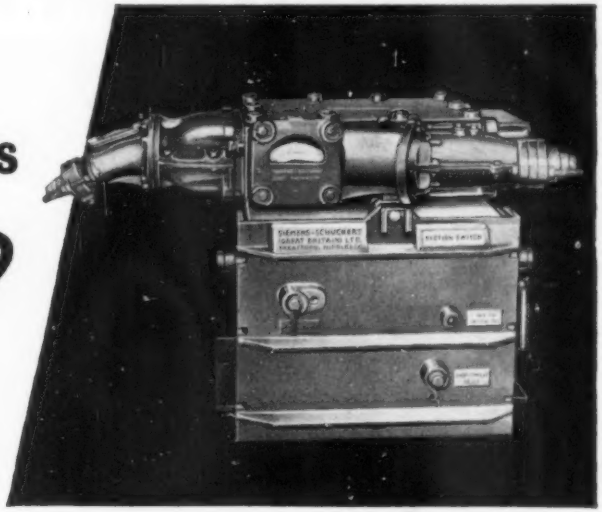

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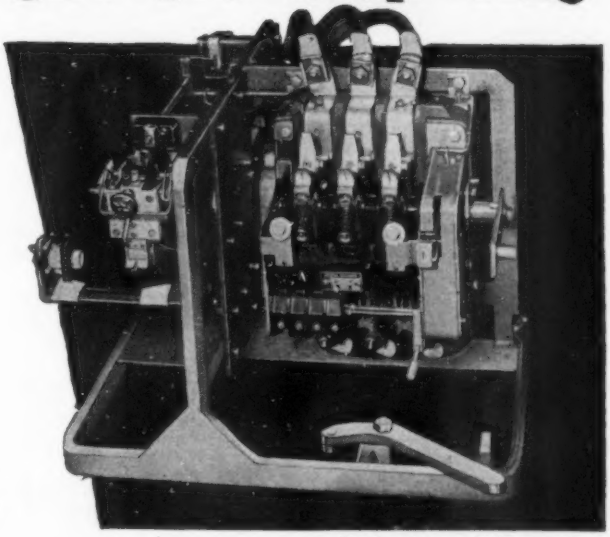
4. **Earth leakage electrical lockout.**
5. **Spring closing and opening action.**
6. **Isolator interlocked with breaker.**
7. **Removable chassis.**
8. **Motor operated remote control if required.**



Interior with arc shield removed.

Siemens-Schuckert (Great Britain) Ltd

The panel conforms to NCB Spec. P. 7/1950. Flameproof Certificates: FLP.3636 Gp 1. and 3637 Gp 11. Lock-out Intrinsic Safety Circuit Certificate IS 1016.

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'SYMONS' VIBRATING BAR GRIZZLIES
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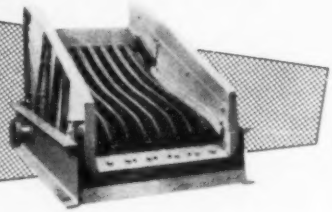
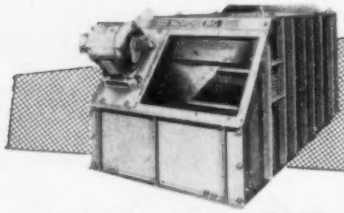
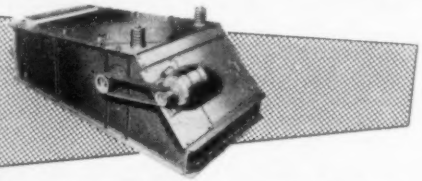
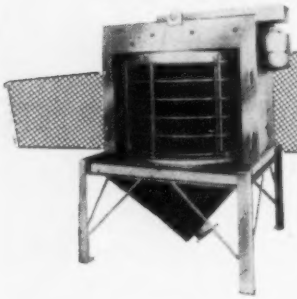




'SYMONS' ROD DECK SCREENS. Patented screening surface utilizing individual replaceable spring steel rods.

'SYMONS' VIBRATING ROD GRIZZLIES for heavy duty big capacity scalping. Ideal for scalping operations requiring relatively coarse separations in the range between 1in. to 4in.





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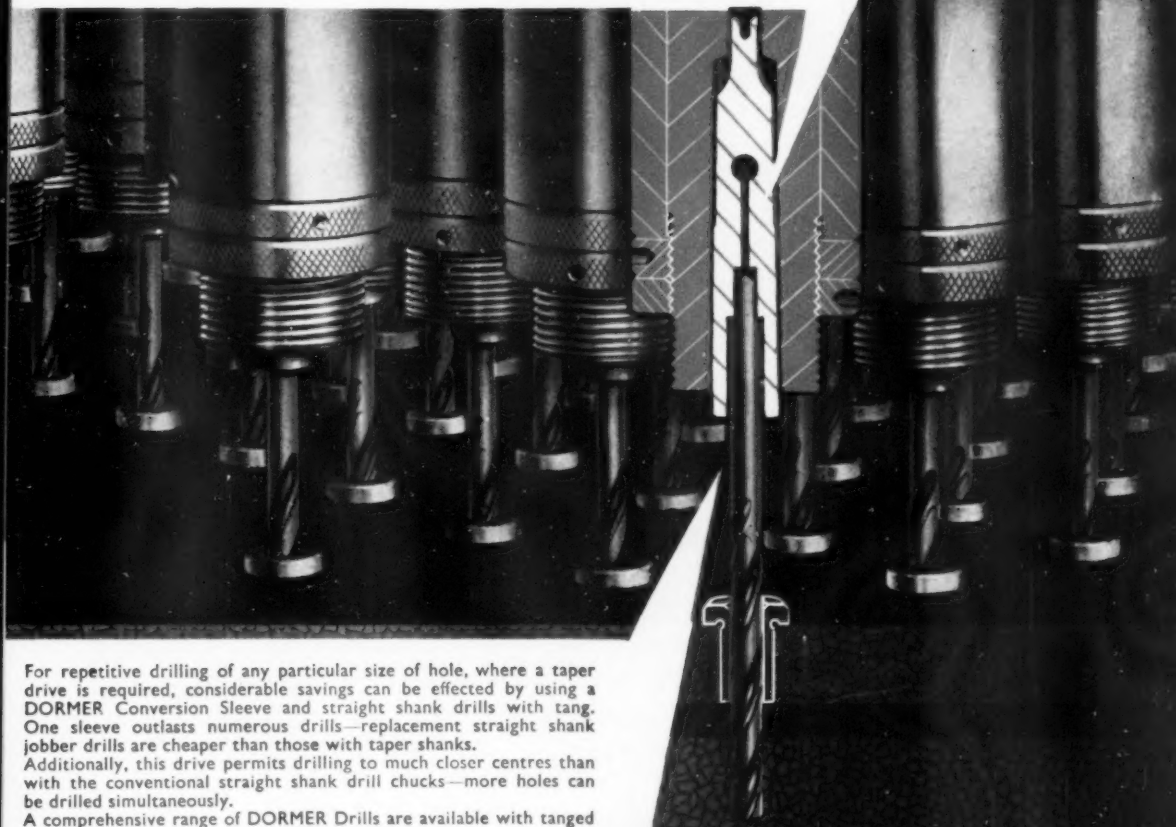

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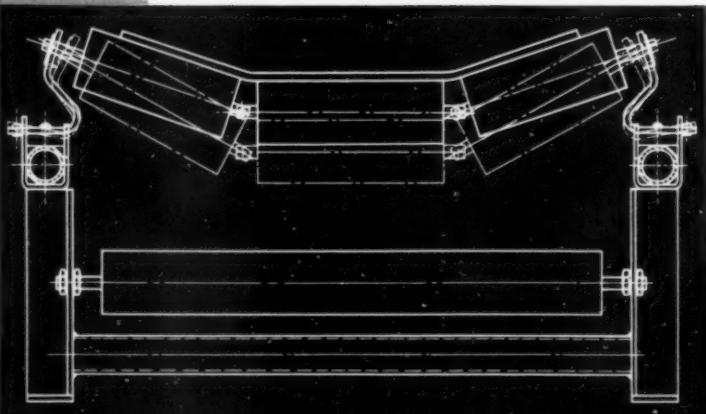
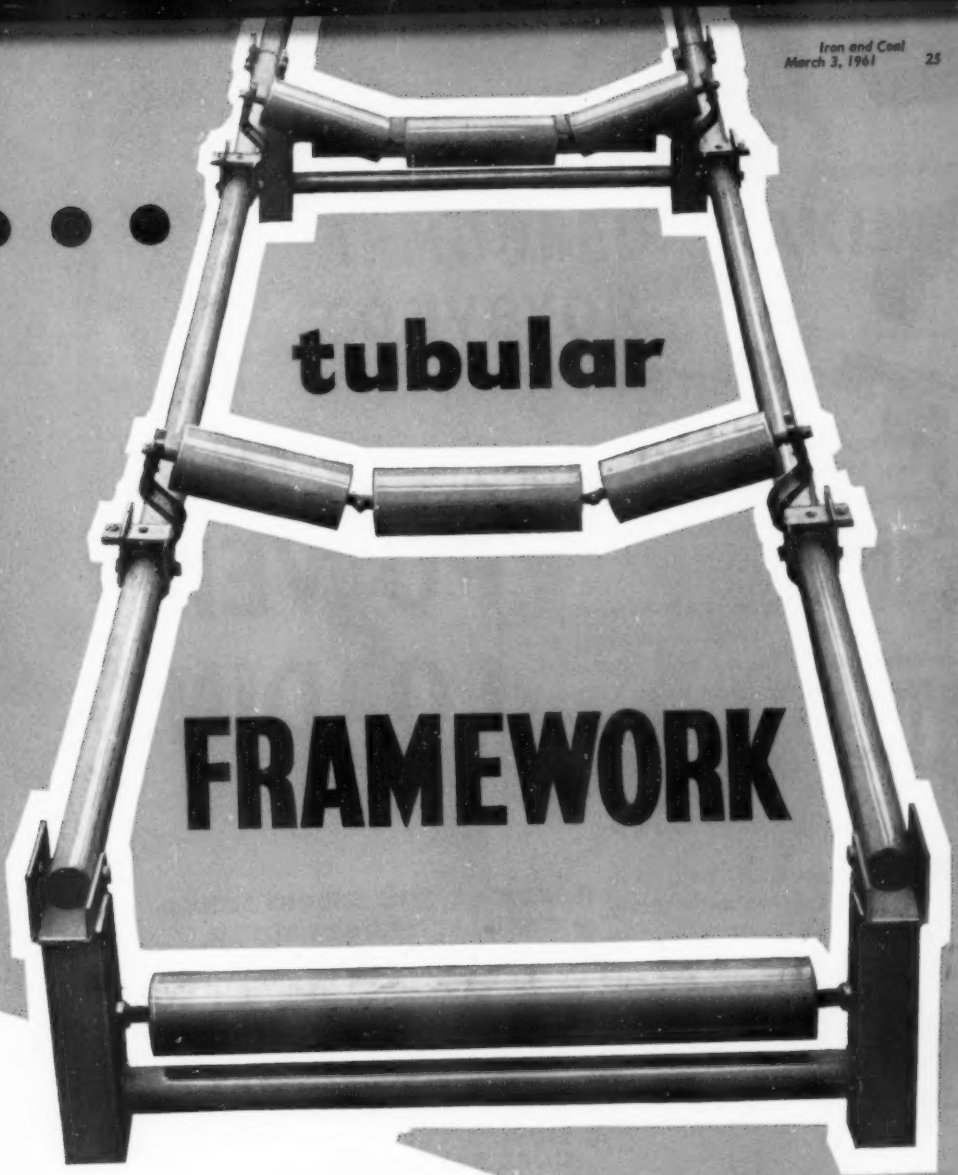


tubular



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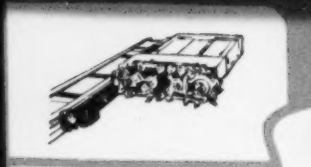
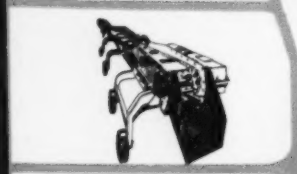
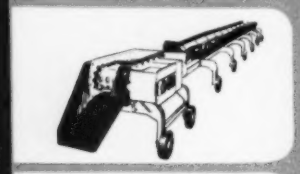
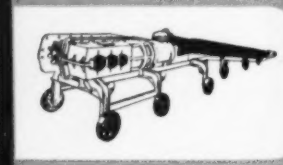
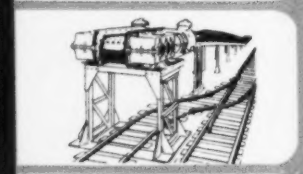
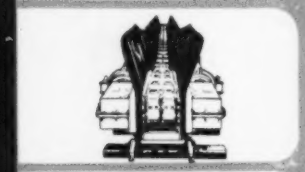
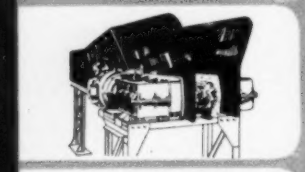
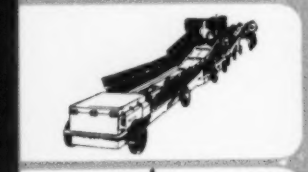
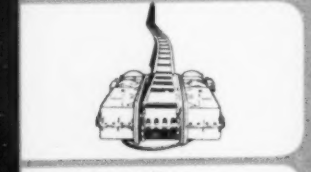

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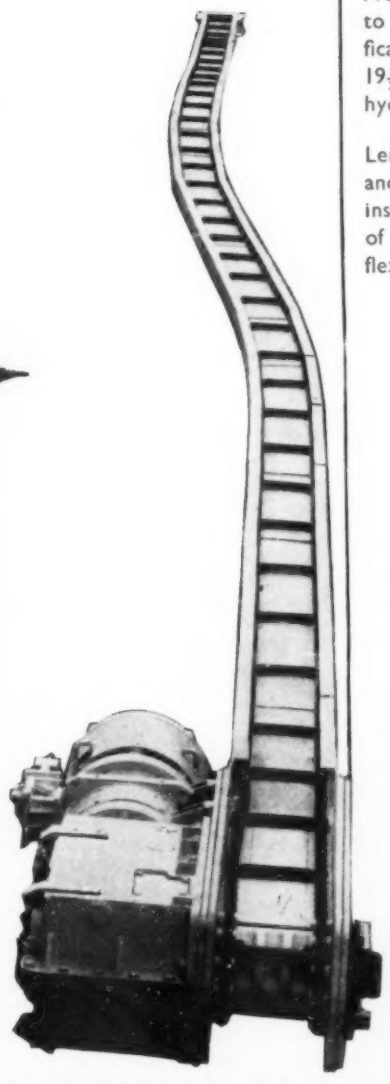

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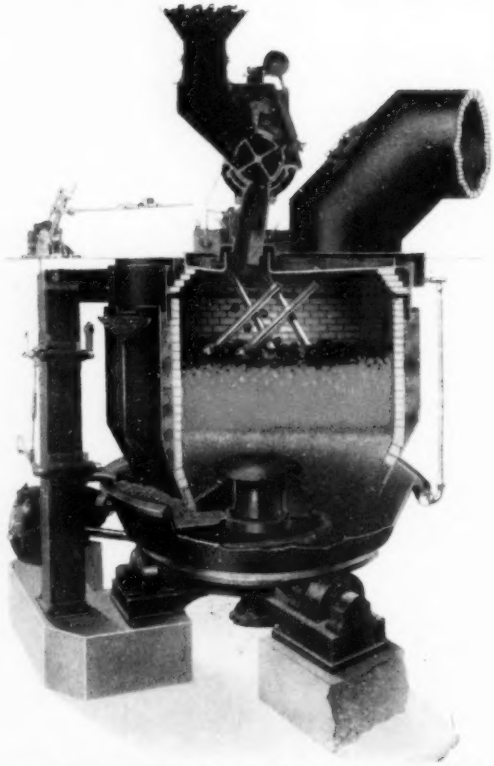

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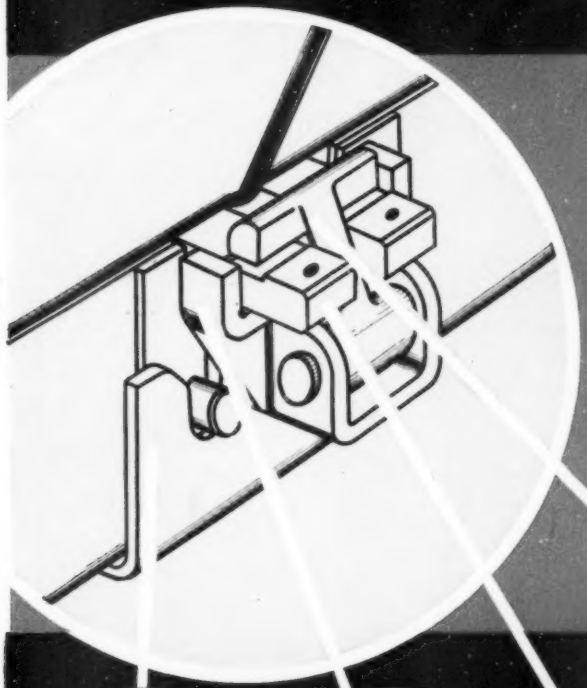
THE COWLISHAW WALKER BUTT JOINT CONVEYOR



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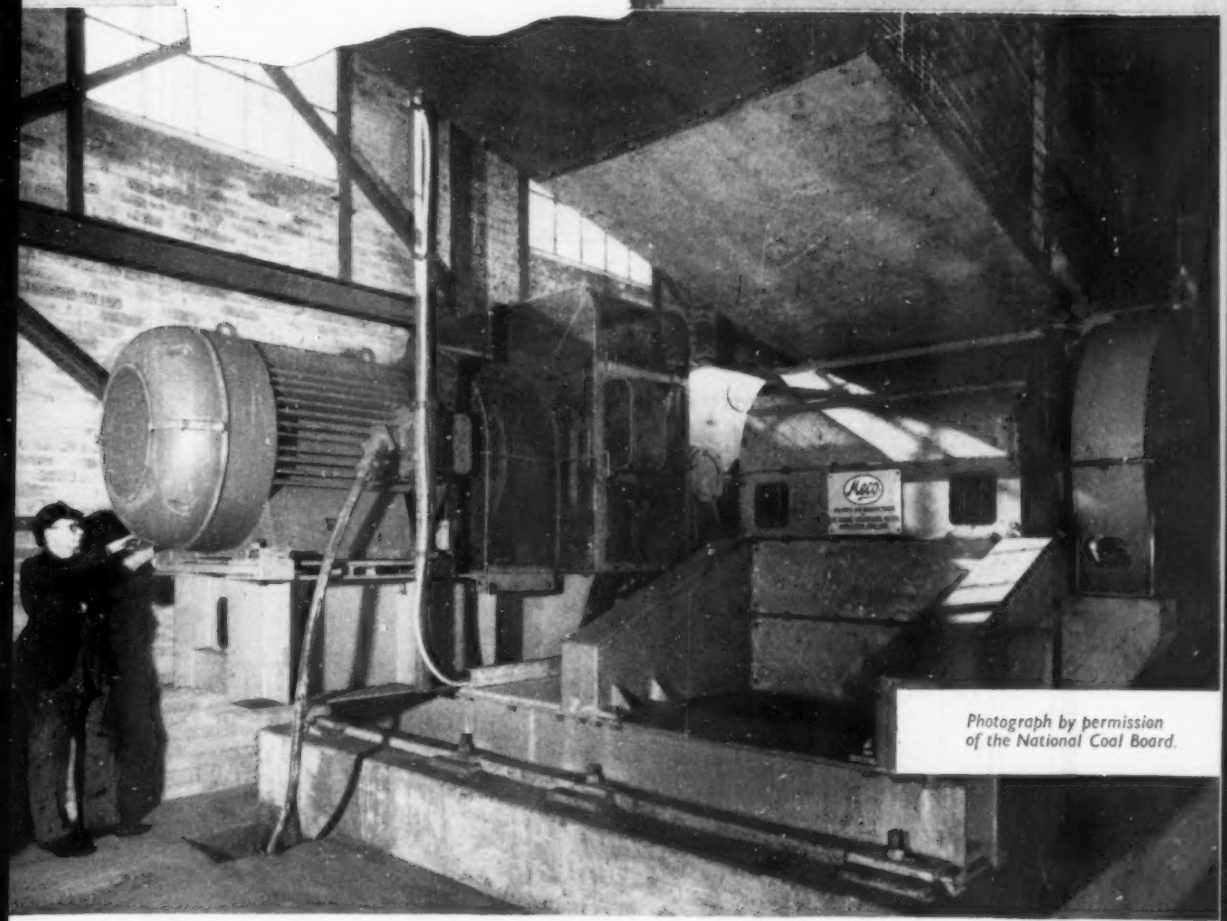

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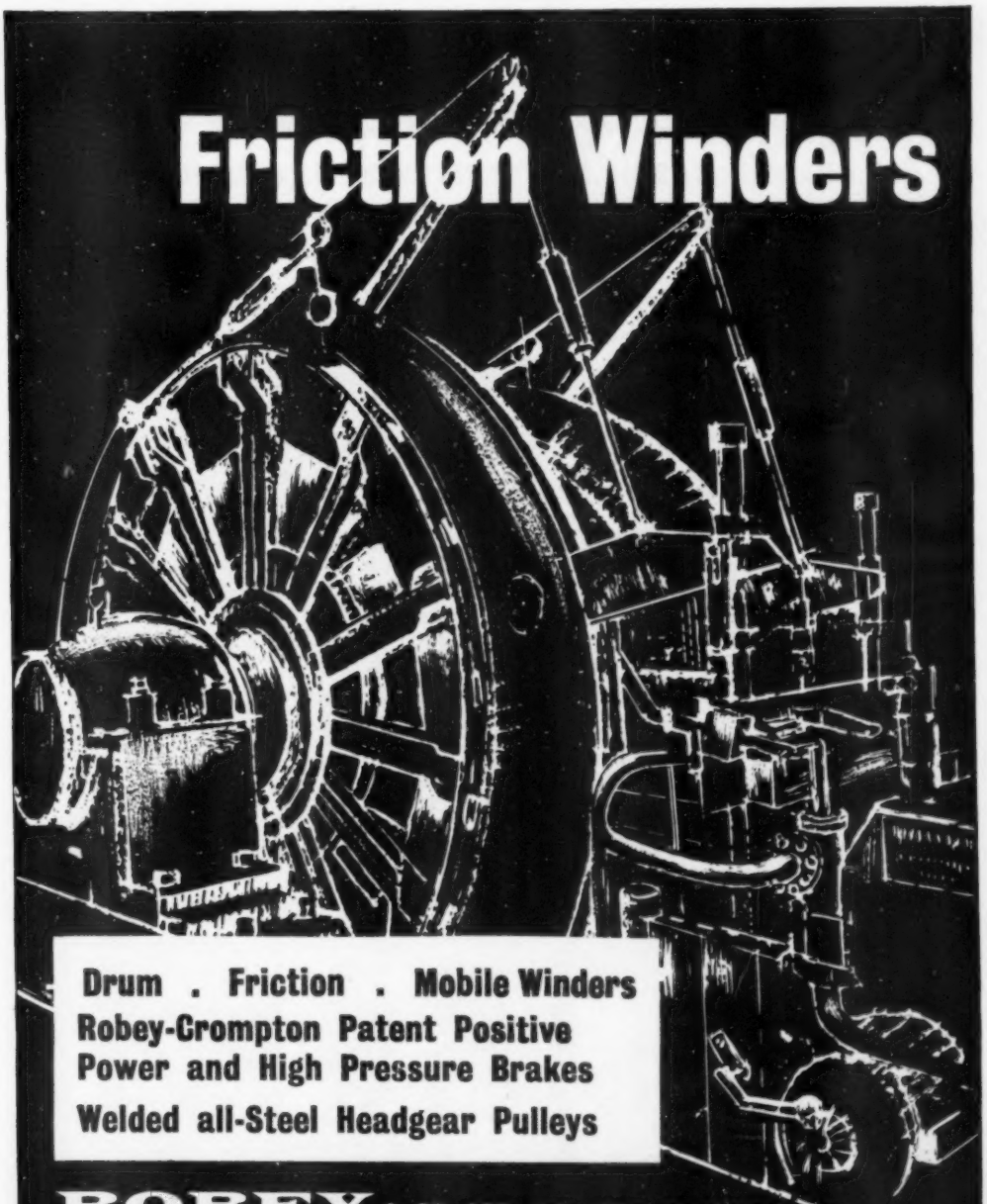

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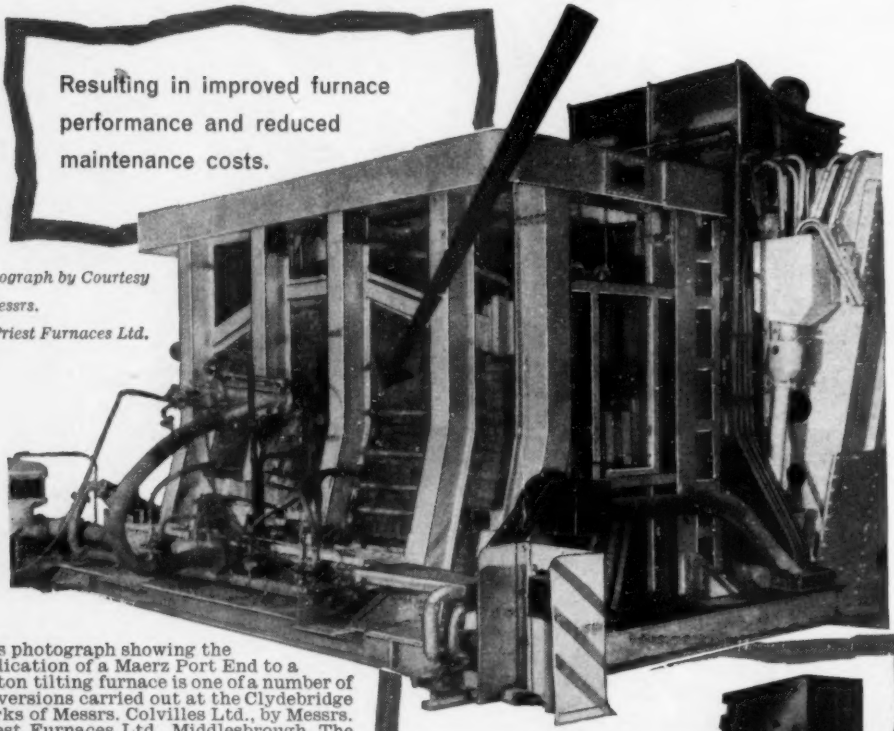
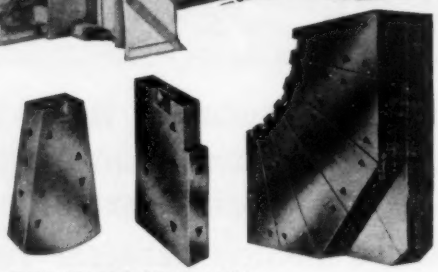


Photograph by Courtesy of Messrs. Priest Furnaces Ltd.

This photograph showing the application of a Maerz Port End to a 350 ton tilting furnace is one of a number of conversions carried out at the Clydebridge Works of Messrs. Colvilles Ltd., by Messrs. Priest Furnaces Ltd., Middlesbrough. The port end is constructed entirely of Ferroclad '70' metal-cased chemically bonded basic refractories.



Typical Ferroclad bricks used in Maerz Port End construction

G.R. Ferroclad bricks are manufactured in a range of four main qualities to suit requirements—chrome (Ferroclad 10), chrome-magnesite (Ferroclad 30), magnesite-chrome (Ferroclad 70) and magnesite (Ferroclad 100). Full particulars and recommendations for the application of Ferroclad bricks is available on request. The manufacture of Ferroclad bricks is covered by British Patents.

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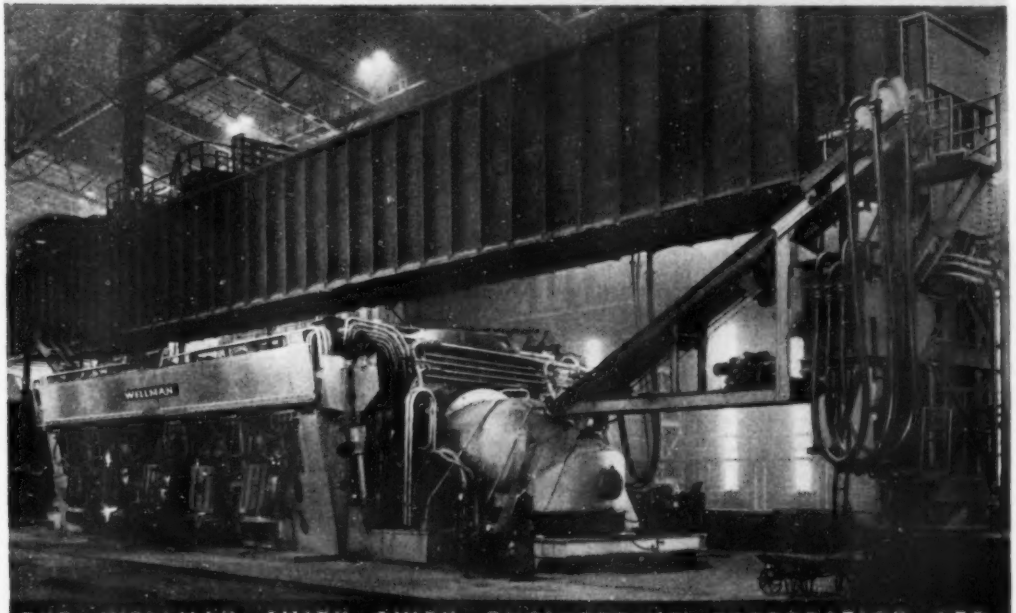

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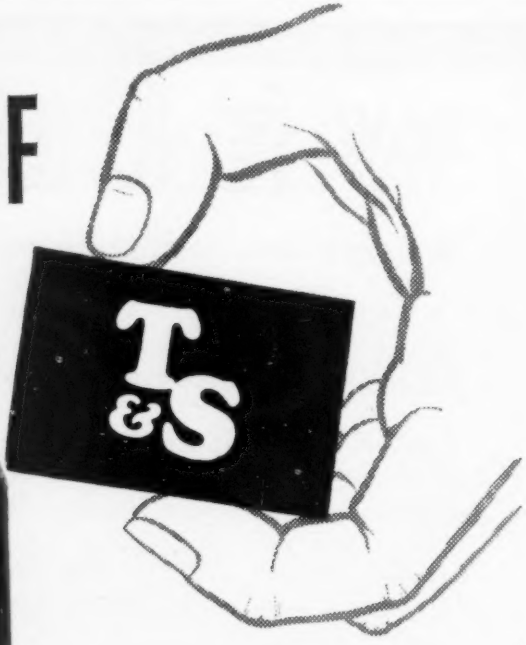

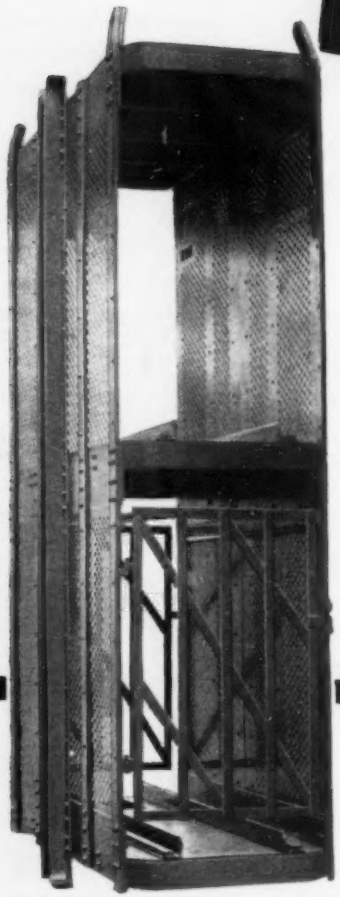

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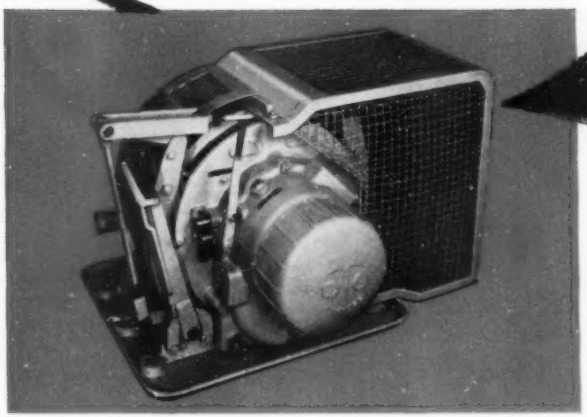

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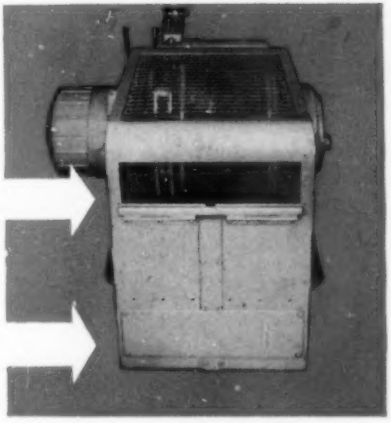

The front panels of the guard may be removed and located in an alternative position depending on whether the rope is overwound or underwound.

The guard is shown fitted to a 'PIKROSE' Size 2 10 h.p. two speed, electric, single drum haulage. This model gives two separate rope pulls, operating at either normal speed, giving an average pull of 2,035 lb at 160 f.p.m. or alternatively a slow speed may be selected, which gives a very powerful average pull of 4,960 lb at 70 feet per minute.

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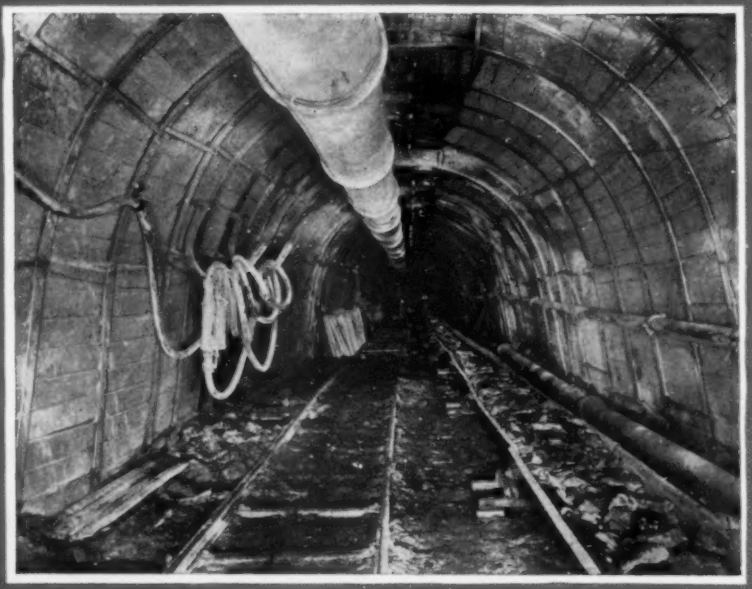
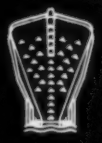


RAPID ECONOMICAL DRIVAGE
with a Distington-Goodman **DUCKBILL**



DISTINGTON

Because it is possible to work safely fairly near to a working duckbill shovel, arches can be set and shot holes drilled while loading with a duckbill. This offers considerable scope for saving time and money. Tunnels can therefore be driven at high speeds and low cost: alternatively, they can be driven at a given speed with less man/shifts.

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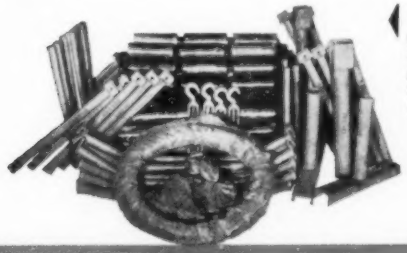
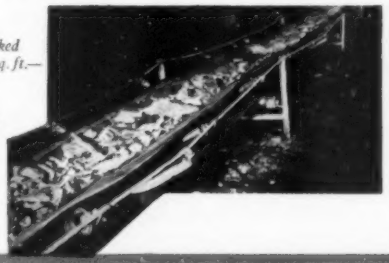


This group of components—stacked in an area of 28 sq. ft.—produce 200 ft. of this conveyor structure



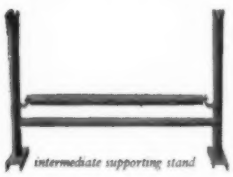
DISTINGTON-GOODMAN ROPE BELT CONVEYOR STRUCTURE patented

swivel links are fitted at each end of an idler shaft

stretchers are used at intervals between stands

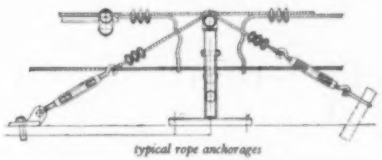
RESILIENT

- *increases belt life*
- *reduces installation costs*
- *increases capacity*
- *almost eliminates spillage*
- *inexpensive*



intermediate supporting stand

main supporting stand



typical rope anchorages

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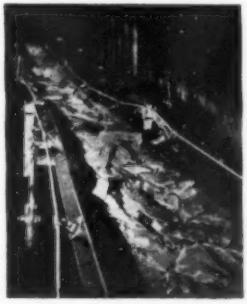
DISTINGTON

Installation, extension and contraction of Distington - Goodman Rope Belt Conveyor Structure is relatively quick and easy.

(Right) Detail of a main stand and anchor point. These can be spaced up to 400′ apart according to requirements.



A 36″ rope belt conveyor installed in a quarry, carrying 500 tons of gravel per hour. By securing the rope to terminal pulleys it has proved practicable to move this conveyor bodily sideways by the dragline shown in the illustration.

BC9a

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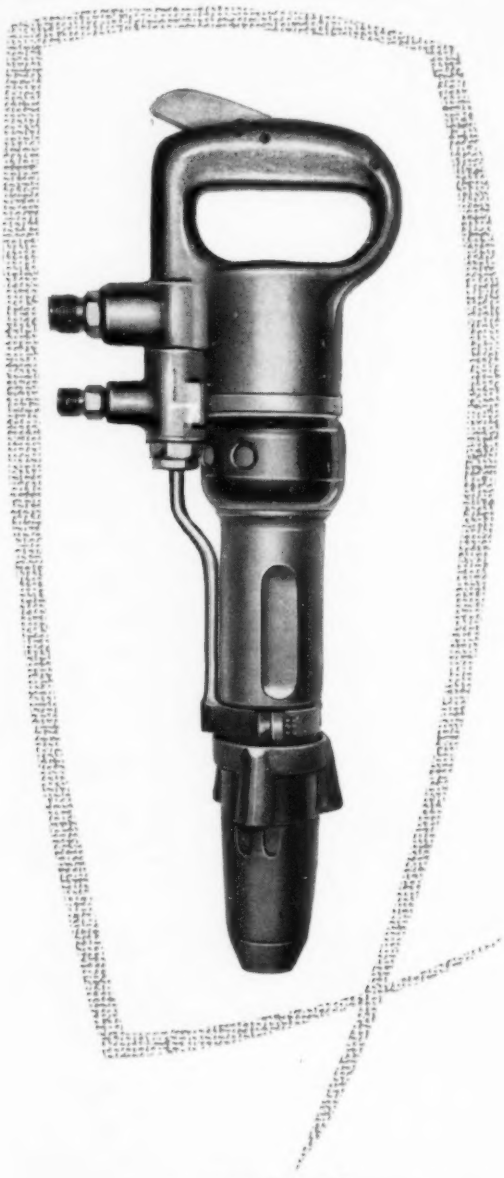
HOLMAN pneumatic picks



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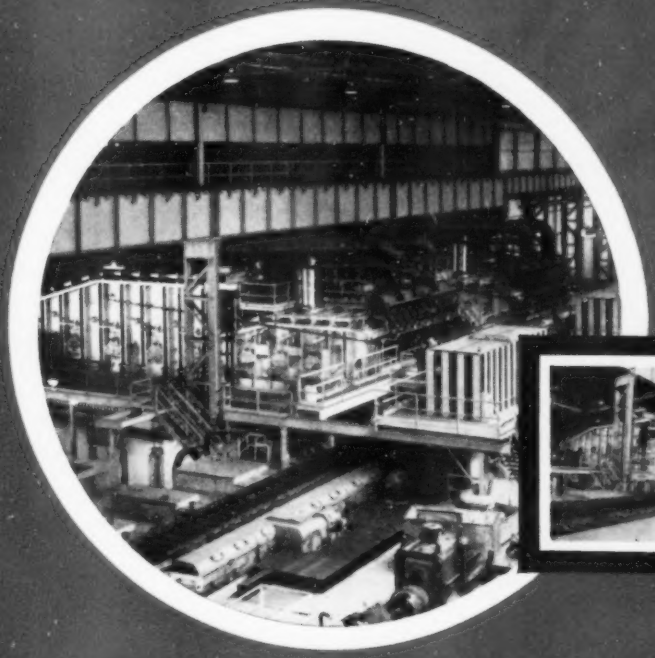

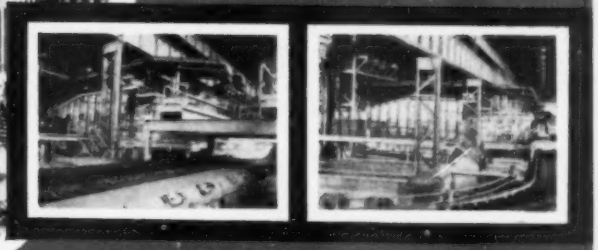

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No. 2. Brymbo Steel Works Limited

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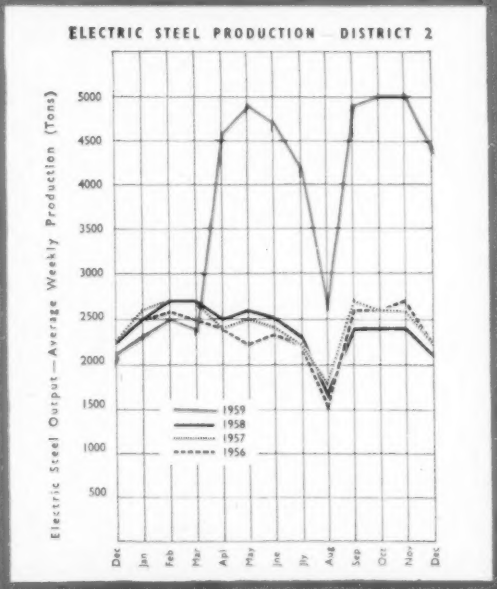
Whereas electric furnaces had previously been used in this country for steel production from cold scrap, the Brymbo installation is the first to employ hot blast furnace metal.



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Vol. 182
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IRON & COAL

THE IRON AND COAL TRADES' REVIEW

MARCH 3
1961

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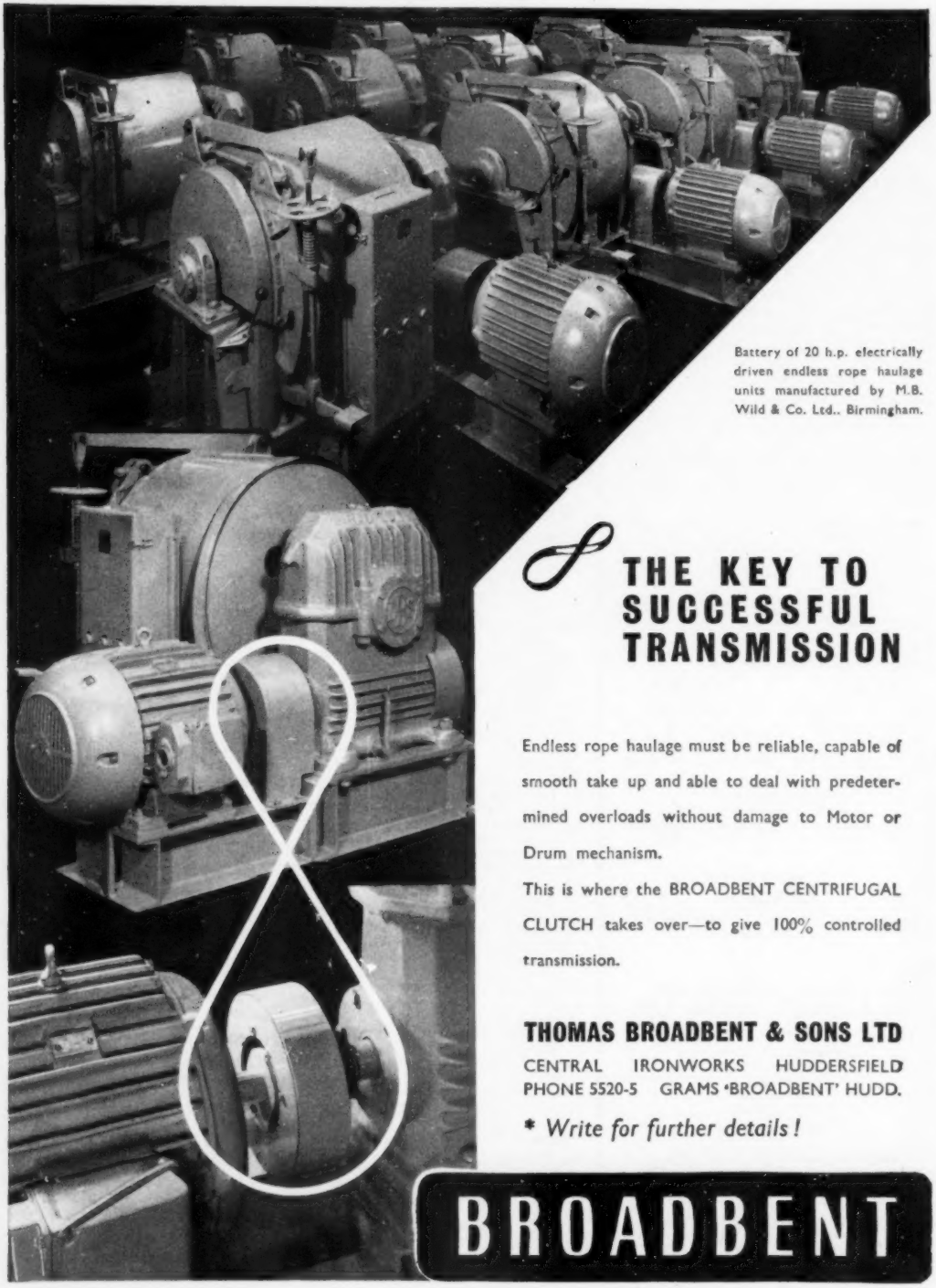

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IRON & COAL
THE IRON AND COAL TRADES REVIEW

Vol. 182 March 3, 1961 No. 4,833

A Scientists' Fuel Policy

THE Association of Scientific Workers' recently published policy statement, " A National Fuel and Power Policy," merits the attention of all who are concerned with the future prosperity of coal and who are not afraid to consider other people's views, however unpalatable they may prove to be. Some of the comments contained in the association's statement certainly call for critical examination. Many people will question the correctness of some of the findings, but others—and we have especially in mind the question of the competition from oil—will be welcomed.

Attention is directed towards the potential danger to our national economy if our dependence on oil increases otherwise that at a negligible rate. As the association rightly points out, few detailed costing figures are available between fuel oil and coal, and in most cases, anyway, the comparison is made between modern automatic oil-fired equipment and obsolete hand-fired coal burning appliances. This must inevitably have the effect of exaggerating such advantages as oil undoubtedly has. No one would deny that oil can be shown to have the merits of cleanliness and convenience, but it must be stressed that great strides in this direction have been achieved for coal. Modern coal-burning plant amply demonstrates this.

On the question of fuel costs, evidence by no means favours oil to the exclusion of coal. Proof that the claims made for oil are not as decisive as some people would have us believe is forthcoming from the number of important industrialists who have, after the closest investigation, decided to rely upon solid fuel. The National Coal Board has made this point—and made it well—in its advertising.

In its recommendations on coal utilization the Association of Scientific Workers' report is on much more controversial ground. The British Coal Utilization Research Association comes in for severe criticism. But those who have first hand knowledge of BCURA's work will strenuously challenge much of this criticism. After putting forward the view that " the present effort of BCURA is unco-ordinated; largely secret developments by appliance manufacturers will not stop the inroads of oil—still less win markets back for coal," the report goes on to suggest that it may be necessary to abandon the conception of BCURA as the National Coal Board agent. The alternative put forward is the creation, under direct NCB control, of a big research and development section. The Coal Board may feel disposed to enlighten the Association of Scientific Workers about the activities of its Central Research Establishment. There is evidence that BCURA and the NCB research personnel are working harmoniously and effectively in certain directions. As far as BCURA is concerned, it has overcome great difficulties, especially in connection with the problem of recruiting and retaining staff of the right calibre, in building up the highly efficient team which now operates at its Leatherhead laboratories.

The report does not confine its strictures to BCURA. On the subject of coke it goes so far as to say that the industry seems unable or unwilling to comply even with the very modest requirements of the new British Standard Specification on " Manufactured Smokeless Fuels for Household Use." This we believe to be far from being the case.

The industry is able, is willing, and is, in fact, complying, although it will obviously take time before there can be total achievement. Nevertheless, the proposal is made that Government supervision should be introduced. We doubt that such a measure would be as helpful as the compilers of the report would appear to believe.

The call for a drastic improvement in the homogeneity of solid fuels will receive wide support. But facts must be faced. A natural product such as coal cannot be compared with a manufactured article and, despite the efforts of the National Coal Board, there will always be variations in the characteristics of coal from different parts of the same seam. That is not to say that there can be no progress towards consistency in quality: it is, of course, of paramount importance that there should be. But there is, unfortunately, a limit set by nature and that limit falls a long way short of the ideal.

Copies of the Index to Vol. 181 are obtainable (post free) on application to the Publisher.

SERIES OF COURSES, the first of which starts on April 10, is to be held in Manchester by the National Industrial Fuel Efficiency Service, and will deal with the latest developments in the firing and handling of solid fuel in industrial plants and commercial premises. Visits to industrial plants, where the latest combustion equipment and automatic controls are in operation, will be made during the course. Enrolment forms and a course syllabus may be obtained from: NIFES, 71, Grosvenor Street, London, W.1.

Passing Thoughts . . .

IN previous years when submitting our representations to the Chancellor, we have ranged widely over many aspects of fiscal policy. We fully appreciate that there are many other taxes, duties and impositions that weigh heavily on industry, but, in the context of the prevailing situation we have decided to put first things first. We have therefore concentrated upon income tax and surtax and have put forward a straight and simple appeal for taxation relief in this direction.—SIR WILLIAM MCFADZEAN, president of the Federation of British Industries, speaking at Glasgow.

There is scarcely a more important task than nursing our overseas markets by a systematic study of their requirements. This endeavour is not being pursued with anything like the vigour we are capable of—once again, perhaps the reason is that we think we know better what they want.—Letter in the Financial Times.

Unfortunately the word rationalization is sometimes misunderstood. It should not raise fears in the minds of those who work in industry because of changes which may take place in their employment for the aim of such moves is to bring more work to this country and to ensure greater stability of employment.—LORD NELSON OF STAFFORD, chairman of the English Electric Company, Limited.

Agitators with political motives cannot achieve much success without some sense of grievance to work on as they move among the men. There is an urgent call for strong union leadership to bring the facts home to the miners to make them understand that negotiations are under way.—Yorkshire Post.

For the first time in my life we find ourselves lagging behind our chief competitor in Europe, the Ruhr coal mining industry. . . . The Germans are still mining coal 900 feet deeper than we are, our seams are still much flatter than theirs, we do not have to drive roads horizontally as the Germans do, nor do we stow coal as they do. Nevertheless, Germany is producing coal at a greater OMS than we are and at a cheaper rate. If that is so—and indeed, it is factual . . . there must be something wrong with our industry.—COL. C. G. LANCASTER, MP, speaking in the Commons.

. . . Mr. Robens must restore the power and spirit of independence of the colliery manager within commercially viable areas, not the stodgy administrative pudding which we have as a Coal Board today.—MR. GERALD NABARRO, MP, *speaking in the Commons.*

It is not so long since men resorted to all sorts of wangles like hiding cigarettes and matches in their sandwiches, the lining of their Thermos flasks, and even in protective rubber casings submerged in the tea. But although I am not satisfied that illegal smoking has been completely wiped out yet, there is no doubt that we have made marvellous headway.—MR. JAMES MILLER, chairman of the Michael Colliery (East Wemyss) branch of the National Union of Mineworkers.

Ours is the worst profession in the world. When industry is good they tell you they don't need you. When it is bad they say they can't afford you.—MR. PETER MULLER-MUNK, *an American industrial designer.*

I remember an old trade union friend of mine telling me of finding two young collier neighbours in their garden one morning when they should have been at work. They said they were on strike, and when he asked why, they replied: "We don't know, but we aren't having it."—BRIG. K. HARGREAVES, chairman of Hargreaves Coal & Shipping, Limited, and other companies, in a letter to the Yorkshire Post.

Methodists have backed out of mining areas because there is drinking connection with the miners' lodges, because there can be swearing at committee meetings, and because many union activities are held on Sundays. That was a terrible mistake and one for which we are now paying the inevitable price.—The REV. WILLIAM GOWLAND, *warden of Luton Industrial College, writing in the Methodist Recorder.*

Hadfields Group Order-book Position Satisfactory

REPORTING that the order-book for all members of the Hadfields, Limited, group, steel manufacturers and engineers, including Millspaugh, Limited, are satisfactory, Lord Dudley Gordon, chairman, warns however that increased costs will have to be met in the current year. The volume of orders in hand, together with those expected to be received, will ensure a satisfactory level of activity generally through both the East Hecla and Hecla works.

Lord Dudley Gordon, in his statement, says that it is likely that certain departments will be overloaded for a time while others are working at a reasonable level, but with some unused surplus capacity due to fluctuations in demand for certain specialities or to an insufficient supply of skilled labour. Every effort is being made to maintain delivery dates.

Referring to exports, the chairman says that the Government could help in certain cases by making it possible for the Exports Credit Department to meet the competition by other exporting countries in the matter of the rate of interest and the length of times and credits.

DROPFORGING OUTPUT RISES

SLIGHTLY increased orders from some other industries had helped dropforgers to weather the recession in the motor industry, Mr. S. Johnson, president, told the annual meeting of the National Association of Drop Forgers and Stampers in Birmingham on Monday. The industry's new methods and expansion schemes meant that dropforgers could meet any demands made on them for a considerable time ahead, he said.

Last year total output was 380,405 tons of drop forgings, compared with 321,107 tons in 1959, and 298,693 tons in 1958. The effect of the motor car recession was not felt until December, Mr. Johnson said. Although there had been a slight increase in motor car activity, there was a lot of leeway to make up if the demand this year was to be anything like last summer's.

LICENCE AGREEMENT has been concluded between F. Pratt & Company, Limited, Halifax, and Praga Tools Corporation, Limited, an Indian Government company, for the manufacture of Pratt self-centring and independent lathe chucks, over a size range of from 4 in. to 48 in. A number of Indian personnel will visit Pratt's works for training and a production team from the UK will set up the necessary production equipment in India.

Steel Expansion in Europe

RECORD INVESTMENT AND PRODUCTION

REFERRING to the " unprecedented expansion " in the European iron and steel industry in 1960, the annual report of the High Authority of the European Coal and Steel Community states that investment in iron and steel rose to an estimated $858,000,000, against $590,000,000 in 1959, while community production of crude steel reached the all-time record of 72,800,000 tons. Investment in iron-ore mining also increased to $46,000,000 ($40,000,000), while that of coal mining rose to $446,000,000 ($409,000,000).

Projects in hand, says the report, suggest that the extraction potential of the iron-ore mines will rise to 104,900,000 tons in 1963, as against 97,200,000 tons in 1959. Production in this industry is not keeping pace with demand, however, and it will be necessary to procure a larger proportion of the total supply of ore from oversea. Capital expenditure on pig-iron plant remains proportionally very high, and the projects indicate a 23 per cent. increase in pig-iron production by 1963.

Investment in steelmaking plant, on the other hand, has fallen off, except in the case of LD, Rotor, and similar steels, the share of which in total production is increasing, while that of basic Bessemer and open-hearth is expected to shrink steadily. According to the survey of investment up to January 1, 1960, steel production capacity will reach 81,900,000 tons in 1963.

$233,900,000 In Loans

The report states that investment in the rolling mill sector is recovering sharply, particularly in the case of flat products, which by 1963 will represent as much as 47 per cent. of all rolled products, against 37 per cent. in 1952. Loans granted by the High Authority to European investors in 1960 included $35,000,000 raised in the US, and firms assisted included Usinor, Finsider, Esperance-Longdoz, Fornicoke, and the ore-preparation company Saizerais. The total amount lent by the High Authority to date from loans contracted by it in the US and Switzerland is $233,900,000.

In 1960, says the report, the steel market remained balanced except during the summer, when there was a slight flagging in the flow of orders from third countries. Inter-community orders for rolled products were 11 per cent. higher than in 1959, although those from third countries dropped by 19 per cent. Total demand worked out 5 per cent. above the previous year's level, at 52,300,000 tons of finished products, exclusive of special steels. Deliveries totalled 52,800,000 tons, with orders in hand at the end of 1960 representing work for approximately three months ahead. The highest rate of increase in steel production was recorded by Italy, with 21.5 per cent., the community average standing at 15.3 per cent. The share of the community in world steel production remained above 20 per cent. (20.7 per cent.).

Proportion of steel made by the new oxygen-blown process is increasing rapidly at the expense of basic Bessemer, the report says. Production of fine and special steels now accounts for 8.1 per cent. of the total, but the most notable is that of flat products owing to the rising demand for sheet (over 10,000,000 tons were produced in 1960).

Joint Iron Council's Marketing Policy

AFTER several months of discussion, the Council of Ironfoundry Associations, with the agreement of the Joint Iron Council, has decided to implement a new market development policy based broadly on the suggestions put forward by the National Federation of Engineering and General Ironfounders. The aim of the policy will be to bring to the forefront in every way possible the technical merits and possibilities of iron castings.

The highly technical and expert fieldwork for the scheme will be carried out using the machinery and services of the Council of Ironfoundry Associations and the final results will be published as technical data. A market development committee has been set up to put the scheme into motion and to supervise the initial stages.

Mr. Malcolm J. Glenny, the chairman of the JIC, and a director of the Dover Engineering Works, Limited, is to preside over the committee. Other members are:—Mr. D. Graham Bisset, vice-chairman of the CIA, and chairman of the Enfield Foundry Company, Limited, who presided over the NFEGI committee which initiated the original proposals; Mr. M. M. Hallett, Chamberlin & Hill, Limited; Mr. E. K. Gould, Goulds Foundries, Limited; Mr. R. A. S. Lomax, Ashwell & Nesbit, Limited; and Mr. C. G. Mackie, Stanton Ironworks Company, Limited.

With the exception of Mr. Gould all are members of the JIC executive committee. Mr. Mackie is also chairman of the British Cast Iron Pressure Pipe Association and of the Cast Iron Segment Association, and Mr. Lomax is chairman of the JIC training and education committee. The council states that there is nothing exclusive about the scheme, neither is it for the benefit of a particular section of the industry. It is for the industry as a whole, both ironfounders and pig-iron producers.

DIPLOMA IN TECHONLOGY

FIVE more women, bringing the total to seven, have been awarded the Diploma in Technology by the National Council for Technological Awards. Two of them, Miss J. Moulton and Miss J. Hunter, gained the diploma for metallurgy which they studied at Birmingham College of Advanced Technology.

The number of students now studying for the diploma is 4,969 and, including the students on this most recent list, diplomas have now been awarded to 450 men and seven women.

Personal

Durham NCB Director to Visit USA

CARBONIZATION director of the Durham Divisional Coal Board, Mr. M. D. EDINGTON, has been invited to address the Blast Furnace, Coke Oven and Raw Materials Conference, which is being held in Philadelphia, Pennsylvania, in April. It will be Mr. Edington's second visit to the US. In 1957, he was a member of a team sponsored by the British Coke Research Association, which spent a month in America studying the carbonization industry.

Mr. Edington will deliver a paper describing the automatic and centralized control systems at the Durham Division's new combined mine, coal preparation plants, and coking plant at Hawthorn, near Murton.

Personnel director of Imperial Chemical Industries, Limited, Mr. C. M. WRIGHT, has been made a Fellow of the University College of London.

Principal of the Technical College, Cowdenbeath (Fife), Mr. W. J. MORRIS has been appointed a member of the Mining Qualifications Board.

Next Mayor of Brighouse (Yorks), will be Cllr. SAMSON WILLIAMS, an employee at the engineering works of J. Blakeborough & Sons, Limited.

Sir JOHN WRIGHTSON, chairman and managing director of Head Wrightson & Company, Limited, has been appointed a Deputy Lieutenant for County Durham.

Mr. T. HEAP, transport superintendent of the Sheepbridge Company, Limited, since 1953, has retired after 46 years' service. He is succeeded by Mr. L. ADAMS.

Mr. P. M. THOMAS, managing director of William Beardmore & Company, Limited, steel manufacturers, of Glasgow, has been elected chairman of the Scottish Council of the FBI.

President of the Canada Life Assurance Company, Limited, Mr. E. C. GILL, has been elected a member of the advisory committee of the International Nickel Company of Canada, Limited.

Engineer at the National Engineering Laboratory of the Department of Scientific and Industrial Research, Mr. DONALD FIRTH (41), has won the £500 Wolfe Award for 1960 for his work on hydrostatic transmissions.

Mr. WILLIAM E. CREW, industrial relations officer of the No. 3 (Edwinstowe) Area of the East Midlands Divisional Coal Board, retired on Tuesday. He has spent 53 years in the industry and was formerly a checkweighman.

Chairman and joint managing director of W. J. Jenkins & Company, Limited, materials handling engineers, of Retford (Notts), Mr. W. MORLAND FOX has been appointed president of the Mechanical Handling Engineers' Association.

Mr. GEORGE STANLEY WALLER, Recorder of Sheffield, who was chairman of the Northern District Valuation Board under the Coal Industry Nationalization Act in 1949, has been appointed Recorder of Leeds and has relinquished the Sheffield appointment.

Chairman and managing director of Goodwin & Company, Limited, crucible steel manufacturers, of Sheffield, and director of many other companies, Sir STUART GOODWIN has given his Sheffield home, Langhill, Manchester Road, to the United Sheffield Hospitals.

New Finance Director of West Midlands NCB

APPOINTED finance director of the West Midlands Divisional Coal Board is Mr. W. M. S. Cairns, who is assistant Area general manager in the Lothians Area of the Scottish Division. He succeeds Mr. W. M. Crooks, who recently became deputy chairman of Durham Divisional Coal Board.

MR. W. M. S. CAIRNS

Mr. Cairns was educated at Hamilton and Ayr academies and at Glasgow University. He qualified as a chartered accountant in 1936 and joined the accounting staff of the Coltness Iron Company, Limited, New Mains (Lanarkshire), becoming chief accountant in 1945. He joined the Coal Board in 1947 as Area chief accountant of the Central East Area of the Scottish Division in Glasgow, and later moved to Edinburgh as divisional chief accountant.

He became divisional chief finance officer in 1955, was appointed assistant Area general manager of the Central East Area in 1956, and moved to the Lothians Area as assistant area general manager in 1959.

Get NCB in Perspective Suggests Durham Area Manager

SAYING that he was quite sure that the general public had not the vaguest idea of the size of the National Coal Board, Mr. J. A. Nimmo, general manager of the North-West Durham Area, Durham Divisional Coal Board, referred to the board as "a much maligned and greatly misunderstood organization," and criticized the general tendency to assume that it was run most inefficiently and needed reorganization. He was speaking at Consett (Co. Durham) Grammar School, where he distributed prizes last week.

In comparison with the Imperial Chemical Industries, Limited, the NCB was nearly twice the size, he said, and though Marks & Spencer, Limited, was a large firm, it was just about the size of one of the board's divisions.

Mr. Nimmo described the NCB as "very much up and coming," and told pupils: "This is your industry and it is an industry of which you can be proud." It offered as much security of employment as any other in the country, he added.

ON TUESDAY the Mond Nickel Company, Limited, an affiliate of the International Nickel Company of Canada, Limited, changed its name to the International Nickel Company (Mond), Limited. The new title is intended to indicate the international nature of the company's activities and to identify it more closely with the parent Canadian company and the US affiliate, the International Nickel Company, Inc.

"Record Winter for Coal"

MR. ROBENS TALKS TO MERCHANTS AND MINING ENGINEERS

"AT all costs we must put an end to the false caricature of the coal trade—a hangover from the days of shortage and rationing—which still sticks in many people's minds, and which pictures the board as a remote and unconcerned bureaucracy, grudgingly sharing out what little it has to the frustrated consumer, with the distributive trade as the harried go-between," said Mr. Alfred Robens, chairman of the National Coal Board, speaking at the luncheon of the Yorkshire Coal Exchange at Leeds on Tuesday.

Emphasizing that the major task of the trade was to ensure the personal satisfaction of the consumer, Mr. Robens made this point: "We have all heard a lot about shortages in different places. But I put it straight to you—do you ever remember a winter when there were no local shortages?"

If they looked at the other side of the picture they would see that the real position was that the demand for house coal had been much larger and more persistent than was expected. By very great exertions by the collieries and by the merchants they had managed to keep the position in hand.

Forecast for the North

Since the beginning of August, NCB despatches to merchants had been 1,750,000 tons above the same period of the previous winter, and merchants' sales to householders had been 2,250,000 tons up in the same period. "In fact," he said, "this has been a record winter for the house coal trade—not a winter of shortages."

As he saw it the board and the trade now had to aim at four main objectives—good service, consistent quality, stable prices, backed up by active publicity—and they had already gone a long way to achieving these objectives.

Speaking at the annual dinner of the North of England Institute of Mining and Mechanical Engineers at Newcastle-upon-Tyne on Thursday of last week, Mr. Robens forecast that a further £50,000,000 would be spent over the next five years on capital works in the coal mining industry in Northumberland and Durham. He did not expect any great changes in the size of the Northumberland, Cumberland, and Durham coalfields but both the Northern (N&C) and Durham divisions would "have to go up a bit rather than down" in the next five years.

He estimated the size of the Northern (N&C) Division as between 11,500,000 tons and 12,500,000 tons of output and the Durham Division at between 21,500,000 and 23,500,000 tons. Recent borings off the Durham coast showed that there was obviously a long life for many of the coastal pits. "We have now been able to bore 5 miles out from the shore and to a depth of nearly 3,000 ft. We have proved vast reserves of rich quality and already reserves proved under the sea are more than 300,000,000 tons," he said.

LETTER to the Board of Trade from the Federation of British Industries urges that the UK should adopt decimal coinage—"an essential step towards the use of the metric system of weights and measures."

One Cause of Mining Troubles

SPEAKING on industrial relations to students at Sheffield University last week, Sir William Garrett, past president of the British Employers' Federation, suggested that the trouble in the coal industry was mainly due to a feeling of disappointment. He said: "During the years before nationalization the coal industry was the worst run in the country. I think the average miner was led to expect that nationalization would mean a lot more than it ever could mean to him personally."

Sir William went on: "Taken by comparison with other industries, however, the mining job is no longer badly paid, and has no longer hours than other industries. But, the era that has arrived isn't quite as golden as they believed it would be."

Regarding negotiations between employers and unions, Sir William said: "The fatal thing, in any industry, is for either side to pull a 'fast one.' This can set back good work for many years." He urged speed in dealing with disputes and grievances.

There was much to be done by industry, Sir William maintained, to overcome the fears and prejudices which had grown up because of talk of labour-saving devices. The lesson to be brought home to both sides was that the real risk of unemployment would come through a continuance of that attitude of mind.

Miners' Pension Scheme gets 100 Per Cent. Support

FIRST of the eight National Coal Board divisions to attain 100 per cent. membership of the mineworkers' pension scheme is the Northern (N&C) Division. When the new State Graduated Pension Scheme starts in April, the miners' scheme will become compulsory, but mineworkers in Northumberland and Cumberland joined voluntarily. The Mineworkers' Pension Scheme started in 1952, and in recent months an individual approach by the board and NUM officials, who explained the advantages of joining, has succeeded in gaining complete support.

The scheme will provide pensions on retirement at the age of 65 of up to £2 a week, depending on years of service. In addition there are incapacity, widows', and children's benefits.

ELECTROTHERMAL ENGINEERING, LIMITED—Mr. E. T. Card has joined the board.

Law Cases

Appeal on Voting Right in Carron Company Lost

THE First Division of the Court of Session upheld a decision of Lord Walker dismissing as irrelevant an action brought against Carron Company, Limited, ironfounders, of Falkirk, by an Edinburgh woman who claimed that she was entitled to a vote in the company's affairs. The action was brought by Mrs. Dorothy Barron Pentland, widow of Mr. Charles Marshall Brown, who, at his death in 1948, was secretary of the company and a voting partner. Mrs. Brown inherited his estate, including 17 shares, each valued at £250, in Carron Company, her shareholding being the largest held by anyone in the company as an individual.

Mrs. Brown sought declarator that she is a partner, entitled to vote in the direction and management of the company's affairs; and reduction of a decision by the company to petition the Privy Council for a supplementary charter amending the Royal Charter granted to it in 1773. Mrs. Brown sought to have the petition withdrawn, maintaining that she had not been consulted on the matter nor given an opportunity to vote on it.

Lord Carmont concurred with the Lord President, Lord Clyde, in holding that the additional articles of co-partnery prevented Mrs. Brown voting unless she had been elected by ballot into the group of shareholders who could vote. Mrs. Brown had never submitted to a ballot. This requirement was still a condition precedent for voting rights.

Lord Guthrie dissented.

DAMAGES OF £156 were awarded at Nottinghamshire Assizes to Mr. Alfred Henshaw (45), a coremaker at the Stanton Ironworks Company, Limited, for personal injuries received as a result of an accident.

DAMAGES of £3,011 were awarded against the National Coal Board to Mr. Norman Abbott (50), who broke both thighs when he was thrown from a new cage as it made its maiden descent in the No. 2 shaft at Thorne Colliery (Yorks). The judge held that the board was two thirds to blame and Mr. Abbott one third.

ACTION for £250 damages brought by Mr. Thomas Allan against the National Coal Board was stopped at Kirkaldy Sheriff Court and the NCB was absolved from the action and granted expenses. Mr. Allan broke four ribs when he was crushed by coal tubs at Michael Colliery (Fife), but failed to produce any corroborating evidence of the accident to the court.

DAMAGES of £1,000, agreed out of court, were awarded at Derbyshire Assizes to Mr. Christy Flynn (29), against his employers, International Combustion, Limited, Derby. Mr. Flynn was stated to have suffered a neurosis condition after being struck on the head by a falling piece of wood.

CLAIM FOR DAMAGES against Hadfields, Limited, Sheffield, by Mr. Joseph Benn (31), a fitter, was dismissed by Mr. Justice Wrangham at Sheffield Assizes. Mr. Benn claimed that a wrench supplied to him was so badly worn that it slipped while he was working with it and he suffered a slipped disc. The judge said that although the wrench was worn, Mr. Benn had failed to obtain a good grip on the work.

"MEN WITH EXPERIENCE take risks which would horrify a lawyer if he saw what happened," said Mr. Justice Wrangham when he awarded damages of £299 to Mr. William Hobson (60), a steel-sawing machine operator, who sued the English Steel Corporation, Limited, for breach of statutory regulations in not fencing part of a dangerous machine. Mr. Hobson injured his hand while wiping down a machine in motion, but the judge held that he was half to blame for the accident.

MINER who was alleged to have threatened to stop the fan at Brodsworth Colliery during a strike on Tuesday was bound over for a year in the sum of £50 at Doncaster Magistrates' Court. Chief Inspector S. C. Mogg said that certain essential workers remained at their posts during the strike at the pit. The miner, Henry Bacon, was alleged to have told three officials working on the fan: "I want the fan stopping and the men withdrawn from the pit." He was also alleged to have said: "I will stop the fan myself."

Senior Appointments at Spencer Steelworks

FURTHER senior appointments to the engineering staff of the Spencer Steelworks, Llanwern (Mon), have been made by Richard Thomas & Baldwins, Limited. Chief fuel and power engineer at the works will be Mr. Francis J. Feltoe.

MR. F. J. FELTOE

He is 36 and graduated from Durham University and was a Clayton Fellow of the Institute of Mechanical Engineers. He began his career as a graduate apprentice and draughtsman with C. A. Parsons & Company, Limited, joining McLellan & Partners in 1949 as a site engineer at the Abbey works of the Steel Company of Wales, Limited. In the following year he joined SCOW as a power plant engineer. In 1954 he became an area engineer with Unilever, Limited, at Selby (Yorks). Mr. Feltoe visited the US and Germany in 1953 under the terms of his Clayton Fellowship to study the utilization of steam in steelworks and he has also visited Belgium to examine package-boiler techniques.

Chief electrical engineer at Llanwern will be Mr. John W. Oswald. Born in 1923, he was educated at Bradfield College and Edinburgh University. He served his apprenticeship with the British Thomson-Houston Company, Limited, Rugby, and in 1949 joined McLellan & Partners, remaining with them until his appointment in RTB. In the course of the last 12 years he has been closely associated with SCOW developments and with the development of the Spencer Steelworks.

Mr. Stephen H. Shillito has been appointed manager of the productivity engineering department. He was born in 1924, and educated at Leeds Grammar School, St. Bees School, Cumberland, and Birmingham University. After a period with a Gateshead firm he entered the NCB as an overman in Northumberland. From 1952 to 1957 he was first undermanager and then manager of Lynemouth Colliery, and then became the method-study engineer of the North Northumberland Area, Northern (N&C) Division.

Steel Exports Curb

"REPEATED WARNINGS" AGAINST GOVERNMENT POLICY

STATING that for a considerable time the steel industry has been restricted by the Government in the export field and ordered to provide better supplies for the booming home industries, Mr. G. H. Latham, chairman of the Whitehead Iron & Steel Company, Limited, says that this has resulted in a tendency to neglect the traditional markets in favour of home supplies, although time and again attention has been called to the danger which is being run in pursuing this policy.

The recession in the automobile industry had been widely publicized but, Mr. Latham emphasizes, although the industry was a valuable customer, it was not "the be all and end all" of steel sales. Indeed, the recession "is giving many of us in the steel trade the opportunity of reclaiming our interest in the export markets by a very vigorous drive."

All the company departments were set for "fair weather" in the current year, and the optimism regarding future demand for steel products which prevailed throughout the industry was borne out by the fact that in 1960 the company produced 24,500,000 tons of steel, which was 2,500,000 tons above the previous highest level in 1957.

"A Sensitive Barometer"

So far, all departments of the company were operating at full capacity, the chairman reports, and there were no raw material problems. The company had always made a practice of diversification in its sales and, therefore, had not felt the effects of the recession in the automobile industry. For the hot rolling mills, it was reasonable to predict that full-time working could be expected throughout 1961.

The cold rolling department was a much more sensitive barometer to external conditions than most parts of the industry, and consequently the back-log of orders had diminished appreciably. However, for the next few months there was a "reasonable prospect" of maintaining the present full-time working. Export business in cold rolled strip had increased substantially during the last few months, when the demand from the home industries had eased off.

Mr. Latham says the industry's combined expenditure will enable it to meet the requirements of the raised consumption which experts predict by the year 1965, and there is every confidence in ability to meet increasing world competition, not only at home but in export markets as well.

He concludes: "We all know it is impossible to convert steel of poor quality into good steel. During the period when the demand for steel has been excessive there has been a tendency in industry generally to concentrate on output at the expense of quality, but I am sure we shall all do well to reconsider this policy now that there are signs of increasing competition both at home and from abroad."

TWO NORWEGIAN wire producers, A/S Mandal Stål, and A/S Tønsberg Reperbane, are to co-operate in the production and marketing of steel wire as a means of meeting foreign competition. Mandal Stål recently commissioned the building of a pilot plant for the production of a rust-resisting aluminium-coated steel wire.

TINPLATE PROSPECTS BRIGHTEN

APPRAISAL of the tinplate market was made last week by Mr. Michael Layton, sales controller of the Steel Company of Wales, Limited. "In the last week or so more orders have reached us than we expected. It looks as though the decline is working itself out and that the demands being made upon us are going to grow steadily," he said.

Consumption now appeared to be running at an even higher rate than in the opening months of 1960, when it rose by 12.8 per cent. on the previous year. "This slight improvement has been concealed because the users began the year with high stocks, whereas last year they were short of tinplate," he pointed out. The recent improvement in the orders of car manufacturers would not be felt until the summer because of the large stocks at the factories. "But from then on demand may recover rapidly. It could even be that sheet will be in short supply again in the last half of the year," he said.

Machine-tool Industry Activity Continues

EXCEPTIONALLY high level of activity in the machine tool industry increased still further during November, 1960—the latest month for which the Machine Tool Trades Association has published figures. In October last year work in hand in the industry reached the £100,000,000 mark for the first time in four years. During November this figure increased by £1,300,000. The order-book was worth £103,700,000—an increase of 86 per cent. on the November, 1959, value—but although higher than the October figure of £102,300,000, the rate at which orders were received was lower than for previous months.

Net new orders worth £11,200,000 (£8,400,000) were placed during November and of these, orders worth £8,900,000 came from UK concerns. New export orders were down by about £7,000 from the October level of nearly £2,400,000.

SURVEY issued by the Belgian Ministry for Economic Affairs shows that from the end of the last war to 1959 the Belgian Government has placed some 52,200,000,000 fr. at the disposal of the national coal-mining industry. Of this total, 20,700,000,000 fr. went to the industry and 31,000,000,000 fr. to workers as social insurance.

Scottish NCB's Chief Surveyor Retires

CHIEF surveyor and mineral estates manager of the Scottish Divisional Coal Board, Lt.-Col. F. J. C. Moffat retired on Tuesday. He is succeeded by Mr. William Smith Drysdale, planning engineer of the division.

LT.-COL. F. J. C. MOFFAT

Lt.-Col Moffat took up a career in mining on returning from oversea military service in 1919. He gained his early experience in the Scottish coalfield, joined John G. H. Geddes, consulting mining engineers, as a surveyor, and became a junior partner in 1927. In 1938 he was appointed a member of the Mineral Valuation Board, Scottish Region, under the Coal Act of that year. In 1924, he was appointed regional manager of the Coal Commission in Scotland and on nationalization he became mineral estates manager with the Scottish NCB. He gained a seat on the Scottish District Valuation Board (Coal Industry Nationalization 1946 Act) and when this work was completed he became chief surveyor of the Division.

Lt.-Col. Moffat is a member of the Institution of Mining Engineers and an associate of the Heriot Watt College. He has recently joined a number of river purification boards on which he will continue to serve during his retirement.

Mr. Drysdale did his early training in the West Lothian coalfields. After a spell in West Africa, he returned to Edinburgh and joined a firm of mining engineers, and later became the mining partner of Duff & Geddes, civil and mining engineers, Edinburgh. After six years in private practice he joined the Scottish Divisional Coal Board in 1947 and held the post of chief surveyor until 1956. During that time he represented the division through all the committee and introductory stages of the new national Code of Practice for Mine Surveying. He also introduced and channelled all negotiations for a new national indentured apprenticeship scheme for mine surveyors.

Since 1956, Mr. Drysdale has been divisional planning engineer in the reconstruction department, where he has been closely associated with all technical aspects of the mining, planning, and development of the Board's programme of new sinkings and major colliery reconstructions. He is a member of the Institution of Mining Engineers and a fellow the Royal Institution of Chartered Surveyors.

AS THE RESULT of an agreement with Hanson-Van Winkle-Munning of Matawan, New Jersey, US, Albright & Wilson (Mfg), Limited, London, S.W.1, will be able to take advantage of American experience in the design of automatic plant for electroplating, chemical polishing, and anodizing. The agreement means an extension to the existing range of plant which the company provides to operate its specialist metal finishing processes.

European Coal Output

THE appended figures relating to coal output and imports are taken from statistics issued from Geneva by the Coal Committee of the Economic Commission for Europe.

Tonnages are metric, and the number of underground workers employed relates approximately to the end of the month.

TABLE 1.—*European Coal Output (Metric Tons) and Employment.*

Country.	Output.		Underground employment.	
	November, 1960.	October, 1960.	November, 1960.	October, 1960.
Belgium	2,011,000	1,944,000	78,000	78,000
France	4,786,000	4,828,000	125,000	126,000
Italy	60,000	56,000	—	—
Netherlands ..	1,148,000	1,070,000	28,000	28,000
Poland	—	9,089,000	—	212,000
United Kingdom ..	15,983,000	15,771,000	467,000	469,000
Spain	—	—	—	—
Western Germany ..	12,333,000	11,609,000	298,000	297,000

TABLE 2.—*European Solid-fuel Imports in November, 1960, with Figure for October, 1960, shown in Brackets (Metric Tons).*

Importing country.	Coal and patent fuel.	Coke.	Lignite and brown coal briquettes.
Austria	366,000 (353,000)	88,000 (78,000)	100,000 (80,000)
Belgium	372,000 (295,000)	22,000 (20,000)	8,000 (9,000)
Denmark	379,000 (383,000)	161,000 (136,000)	32,000 (31,000)
Finland	350,000* (331,000)	20,000* (20,000)	— (—)
France	919,000 (896,000)	421,000 (465,000)	37,000 (44,000)
Greece	16,000* (16,000)*	1,000* (1,000)*	— (—)
Eire	130,000* (127,000)	1,000* (1,000)*	— (—)
Italy	869,000 (775,000)	20,000* (21,000)*	15,000* (16,000)*
Luxembourg	21,000 (20,000)	332,000 (354,000)	12,000 (12,000)
Netherlands	631,000 (691,000)	26,000 (29,000)	23,000 (44,000)
Norway	45,000* (42,000)*	25,000* (24,000)*	— (—)
Portugal	17,000 (34,000)	3,000 (1,000)	— (—)
Sweden	203,000 (204,000)	215,000 (170,000)	2,000 (2,000)
Switzerland	153,000 (173,000)	40,000 (44,000)	20,000 (18,000)
United Kingdom	— (—)	— (—)	— (—)
Western Germany	750,000 (670,000)	35,000* (30,000)	500,000* (481,000)

Pit Veterans' Service Recognized

CENTURY of service in the mines was recognized at the annual dinner of the Calverton (Notts) branch of the National Association of Colliery Overmen, Deputies, and Shotfirers on Saturday when presentations were made to Mr. Walter Lee and Mr. Jack Coleman, both of whom have served for over 50 years in the pits. Mr. Lee has been secretary of the branch since 1942.

Calverton Colliery is the newest pit in the No. 6 Area of the East Midlands Divisional Coal Board and the newest pit in the country to have reached full production. Paying tribute to the members of the association at the mine, Mr. W. Sharp, production manager of the No. 6 Area, said that it had one of the best records of production and safety in the area.

OPEN-CAST ANTHRACITE DRIVE

Probable Increase in South Wales Workings

DRIVE to increase open-cast mining in the anthracite areas of the South Wales coalfield is expected to begin soon. Following talks with miners' leaders in Cardiff last week on the need for more anthracite, Mr. Alfred Robens, chairman of the National Coal Board, said that discussions on the subject had been started with the National Union of Mineworkers. Assurances were given that pits would not be closed down as a result of more open-cast work.

Mr. Robens said that a big anthracite sales campaign would begin in April which would increase the present good demand for anthracite as boiler fuel, particularly in London and the Home Counties, which South Wales could supply conveniently. The board did not want to lose the new interest in anthracite, or lose any of the market to the oil industry.

"Before creating the market we want to make sure the anthracite is available," said Mr. Robens. To do this, open-cast mining would fill the gap between the present and the time when the three new deep anthracite mines at Cynheidre, Abernant, and Brynlliw were in full production.

Assurance on Pit Closures

Present at the talks, which were held at the Llanishen headquarters of the South-Western Divisional Coal Board, were Mr. A. H. Kellett, chairman of the division, Mr. A. Walsh, deputy chairman, Mr. G. S. Morgan, director of production, Mr. G. Evans, director of industrial relations, and Mr. D. F. Pexton, marketing director. The miners were led by Mr. Will Paynter, general secretary of the NUM, who was accompanied by Mr. Will Whitehead, president of the South Wales area of the NUM, and other area officials.

Mr. Robens stated that the miners' leaders appreciated the position and were with the board in wanting to capture the market for anthracite. "Naturally they have fears about open-cast mining because in 1959 a number of pits were closed. Now that we want more anthracite, they want to be sure of the future. We have assured them that no pit will be closed as a direct result of open-cast work. We have also assured them that if in two or three years there is a slackening in demand for anthracite, open-cast operations will close before the deep mines."

Mr. Robens said that it had been made clear that the industry could never suffer from over-production of anthracite. There was the export trade, and the tremendous potential in the boiler trade at home. He added that, in future, the divisional boards would have more to say in open-cast operations, which should lead to better relations with the men. The present production of open-cast anthracite is 700,000 tons a year, and it is hoped to increase this to 900,000 tons.

CZECHOSLOVAKIA'S STEEL PRODUCTION reached nearly 6,800,000 metric tons and that of pig-iron 4,695,000 tons last year. Some 798,000 tons of Czech rolled products were exported in 1960. Coal output for the year stood at 26,400,000 tons of hard coal and 54,900,000 tons of brown coal.

Mr. Robens Plans More Heat Service Centres

"WE in the mining industry will do our utmost to see that the customer is given service of the first quality," said Mr. Alfred Robens, chairman of the National Coal Board, at the opening of the new Heat Service Centre in Newcastle, last Friday. Saying that he believed the centres were important in getting solid fuels across to the customer and improving the service, Mr. Robens announced that another centre is to be opened in Darlington in the spring and the board has plans for further centres in key industrial areas.

Dealing with the efforts being made by the board to help customers, Mr. Robens went on: "One example of the type of service we aim to give can be seen in Durham where 'Charrold' lorries, with built-in conveyors for direct delivery, are now in use. They have proved so effective that I understand that architects in County Durham are beginning to design their boiler houses to take advantage of this service."

He continued, "1960 was an encouraging year, 1961 is going to be better still. We shall show industry that modern coal-fired plant is the best buy. We shall show the housewife that modern appliances need little attention, that they can use solid smokeless fuels in smoke control areas and that they are ideal for central heating."

Mr. Robens said that there are plentiful supplies of Sunbrite, the smokeless fuel locally produced by the Durham Divisional Coal Board, and described it as ideal for openable stoves and boilers.

"COAL AND THE GROWER" EXHIBITION

EXHIBITION designed to show horticulturalists how to save money on fuel and labour costs by installing modern efficient coal-burning appliances, was opened in Cheshunt (Herts), on Thursday of last week by Mr. L. C. Madsen, chairman of the Lea Valley Growers' Association. The "Coal and the Grower" exhibition was organized by the London and Southern Region sales office of the National Coal Board.

The NCB regional sales manager, Mr. R. Elliott, said that the board regarded the growers as an important market and that the exhibition was intended to show that while coal was an old industry it had not stood still, but had developed modern methods of handling and burning coal at high efficiencies and with a high degree of automation.

Peak ECSC Investment During 1960

INVESTMENT proposals lodged by industry in the European Coal and Steel Community last year amounted to US $1,954,000,000, compared with $1,800,000,000 in the three-year period 1957-59, states the High Authority of ECSC, which adds that this high level of investment is continuing into the current year. Of the 1960 sum, coal-mining development accounts for $146,000,000, iron-ore mining $6,000,000, and the iron and steel industry for the remainder. About $930,000,000 is connected with projects in the rolled steel industry, and $520,000,000 on plans for flat steel. Steelworks investment accounts for a further $357,000,000, furnace coking plants for $41,000,000, Möller processing units for $132,000,000, and blast furnaces for $149,000,000.

Based on these investment projects are the estimated new production capacities for the Community's ferrous metals industry. Raw steel capacity is expected to increase by 13,200,000 metric tons, and pig-iron capacity by 7,300,000 tons. Both the Thomas and the Siemens-Martin processes are expected to lose ground. Sinter capacity will increase by some 50 per cent. to 45,000,000 tons. In the rolled steel field, capacities are expected to increase by 7,400,000 tons for semi-products and 2,900,000 tons for structural sections.

THE QUEEN AT DURGAPUR

THE QUEEN VISITING THE DURGAPUR STEELWORKS, WEST BENGAL, RECENTLY DURING HER FAR EASTERN TOUR. THE DAY AFTER HER MAJESTY'S VISIT THE MEDIUM SECTION MILL AT THE WORKS ROLLED ITS FIRST SECTION—A 200 MM. BY 100 MM. JOIST. DURGAPUR IS BEING BUILT BY THE INDIAN STEELWORKS CONSTRUCTION COMPANY, LIMITED, (ISCON)—A CONSORTIUM OF 13 OF THE UK'S LEADING ENGINEERING COMPANIES. IT IS THE LARGEST SINGLE EXPORT ORDER THAT GREAT BRITAIN HAS EVER HAD—WORTH £120,000,000.

Iron-ore Survey Planned

APPLICATIONS by the Park Gate Iron & Steel Company, Limited, and the Nassington Barrowden Mining Company, Limited, for permission to extract by open-cast methods ironstone from an area of several thousand acres in parts of four Midland counties have given rise to a combined county council decision to commission an expert report on the supply and distribution of home and foreign ore to the iron and steel industry generally.

The report will have particular reference to the applications that have been made by the two companies. Park Gate Iron & Steel plans to work an area of nearly 7,000 acres extending over parts of Northamptonshire, Rutland, Lincolnshire (Kesteven), and the Soke of Peterborough, in connection with its new steelworks project at Rotherham (Yorks), which will use home ore.

In a report before Northamptonshire County Council last week reference was made to the agreement reached 10 years ago with the Ironstone Producers' Association that the only areas to be specifically reserved for ironstone extraction were those which the companies were likely to open up within the next 20 years. The agreement had worked satisfactorily, but the new applications represented in scope and location, a complete change in ironstone development within the county.

£100,000 Expansion Projects by Coltness Iron

PROJECTS which will lead to further diversification in the activities of the group are planned by Coltness Iron Company, Limited, cement, limestone, and brick manufacturers, of Glasgow, says Mr. James F. H. Houldsworth, chairman, in his annual statement. These will involve an initial expenditure of about £100,000 to cover the cost of acquisition and to provide the necessary working capital. After this provision there will remain an excess of liquid resources, and it is proposed that a proportion of this should be absorbed by making a return of capital to shareholders of £131,251, representing 1s. 8d. per share, which will reduce the nominal value of the shares to 5s. each.

Improved trading results in 1960 were due largely to the more favourable results achieved in the manufacture of cement and bricks, says the chairman. The engineering subsidiary, Beckett & Anderson, Limited, had shown a fall in profits, but there were signs of increased activity during the last few months. The nail manufacturing subsidiary, J. & W. Somerville, Limited, had produced results similar to the previous year.

GEC-ICT Link Strengthened

NEW subsidiary—I.C.T. (Engineering), Limited—is to be formed by International Computers & Tabulators, Limited, on the basis that 90 per cent. of the capital will be held by ICT and 10 per cent. by the General Electric Company, Limited.

On the formation, ICT will take on the majority interest in Computer Developments, Limited, the company formed jointly with GEC in 1956 under the agreement between the two companies to associate and develop their specialist knowledge in their respective fields in regard to computers.

TEN YEARS' LARGE-SCALE *Vacuum Degassing of Steel*

by Dipl.-Ing. KARLHEINZ WERNER

This report of the Iron Research Institute at Henningsdorf (director: Prof. Dr. Wolfgang Küntscher) is a comprehensive review of the theory and practice of vacuum degassing of steel. It is translated from Neue Hütte, 1960, V. No. 7, pp. 383-398. The article is being published in two sections; the second part, dealing with installations for vacuum degassing, methods of operation of vacuum degassing plants, the action of vacuum degassing on impurities, properties and uses of degassed steel, and economics of vacuum degassing, will be published in our next issue.

EVEN at a very early stage, steelmakers recognized that the quality of their products could be improved through a vacuum treatment. As long ago as March 29, 1892, the Englishman, Russell Aitken, was granted a patent for the vacuum degassing of molten metals (J. M. Mowat)[1]. On October 23, 1883, the American, Robert H. Gordon, obtained US patent 287,273 for a method of casting ingots in vacuo[2].

The practicability of these methods failed, however, through lack of correspondingly powerful vacuum pumps, a need which, even during the years 1932 to 1935, caused the failure of the experiments of J. Korbers in the degassing of liquid steel in the ladle[3].

Only the development of sufficiently powerful pumps, in connection with the requirements of consumers of high-purity materials for application in nuclear energy plants, in highly stressed aircraft and rocket motors, in electronic instruments, etc., made it possible once more after the second world war to bring new life into research in the field of vacuum metallurgy. Vacuum induction furnaces were built, the largest of which today has a capacity of about 2.5m. tons at a power capacity of 1,100 kW. According to P. W. Hammarlund, it will be possible to raise the furnace capacity up to as much as 4.5 to 5 m. tons[1].

Another vacuum melting process consists of melting an electrode into a water-cooled, copper ingot mould at a high vacuum. In accordance with this method, at the present time steel ingots up to about 13m. tons can be produced[4].

Both melting processes, therefore, permit only the vacuum degassing of limited quantities of steel and alloys, and, indeed, above all high heat-resisting materials, thermal conductor alloys, alloys for electronic instruments, soft magnetic materials, reactor materials, high fatigue limit alloys, and other special alloys of high quality[5]. At the same time, ever greater preference has lately been given to the vacuum-arc furnace process, on account of the lower costs, which are only about half as high as those of the vacuum induction furnace process. But for producers of steel in large quantities the methods already mentioned do not enter into the question. For the degassing of large quantities of steel, therefore, other means had to be found. Korber had shown the correct approach 20 years ago.

1—THEORETICAL CONSIDERATIONS

Theoretical questions in connection with the vacuum degassing of steel have been the concern of A. M. Samarin[6], O. Winkler[7], A. Tix[8], F. Harders, H. Knüppel, and K. Brotzmann[9], Z. Eminger, J. Kinsky, and Z. Kletecka,[10] and Z. Motloch.[11] In accordance with these research works, we can distinguish four groups of steel impurities, the behaviour of which, in vacuo, is quite different.

Gases Dissolved in Liquid Steel

As gases dissolved in liquid steel we must consider hydrogen and nitrogen. Nitrogen passes into the steel from the furnace atmosphere, above all in electric-arc furnaces through the dissociating action of the arc, and in the bottom-blown converter from the blast, as well as from alloying elements, such as ferro-chromium or ferro-manganese, which readily pick up nitrogen. Nitrogen decreases the strength at low temperatures and the resistance to ageing of steel.

Hydrogen arises from the furnace atmosphere, from a rusty or oily charge, moist additions, and alloying elements, as well as from inadequately dried refractories. Hydrogen causes embrittlement and gives rise to blowholes, primary grain boundary cracks, flakes, and fish eyes.

For the solubility of both these gases in the melt of iron the Sievert Law is valid.

$$(H) = K_1 \sqrt{P_H} \text{ per cent. by weight}$$

and $(N) = K_2 \sqrt{P_N}$ per cent. by weight

in which the constants K_1 and K_2 are always valid for a definite temperature. At 1,600 deg. C., for instance, the value of K_1 is 0.040 and K_2 0.0027.[12]

This law states that the gas content of a melt under definite conditions is directly proportional to the square root of the partial pressure of this gas in the gas atmosphere to be found above the melt. A decrease in the partial pressure accordingly corresponds to a drop in the solubility of the gas in the melt (Fig. 1). Moreover, the gas solubility can also be influenced by alloying elements in the melt, as Fig. 2 shows in relation to

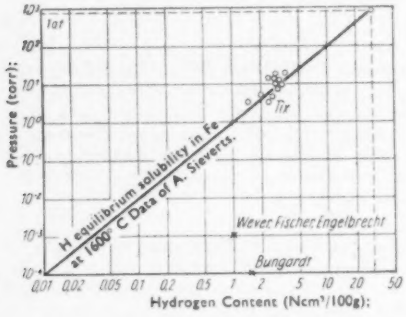

FIG. 1.—DOUBLE LOGARITHMIC PRESENTATION OF THE HYDROGEN CONTENT IN STEEL IN RELATION TO PRESSURE. (DATA FROM A. SIEVERTS[5]).

nitrogen as an example. In accordance with this diagram the solubility of nitrogen in iron is considerably increased by chromium, whereas it is reduced by carbon and phosphorus.

Gases from Chemical Reactions in the Liquid Steel

This group includes only carbon monoxide which is insoluble in steel, and gives rise to the dreaded peripheral blowholes and pores, if it can no longer escape from the freezing steel ingot. Its formation takes place in accordance with the familiar equation

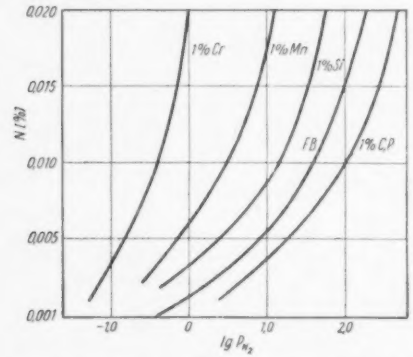

FIG. 2.—EFFECT OF PRESSURE ON THE SOLUBILITY OF NITROGEN IN LIQUID IRON AND SOLUTIONS OF IRON WITH OTHER ELEMENTS AT 1,600 DEG. C.[6].

$$(C) + (O) = (CO),$$

which is dependent on temperature and above all on pressure, where

$$K_3 = \frac{P_{CO}}{(C) \cdot (O)}$$

or

$$(C) \cdot (O) = K_3 \cdot P_{CO}.$$

The product (C) . (O) is thus likewise directly proportional to the partial pressure of the CO in the gaseous phase located above the melt. Through reduction of the partial pressure of the CO, therefore it is possible to decrease the contents of carbon

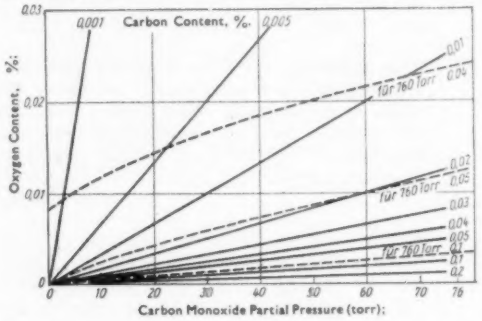

FIG. 3.—CARBON AND OXYGEN CONTENTS OF STEEL MELTS AT LOW CO PARTIAL PRESSURES[9].

or oxygen or of both elements in the steel (Fig. 3), *i.e.*, through the reduction in pressure the deoxidizing action of the carbon is heightened, so that finally it exceeds the deoxidizing action of the strongest deoxidizing agents (Fig. 4).

Slag Inclusions

During precipitation deoxidation, reaction pro-

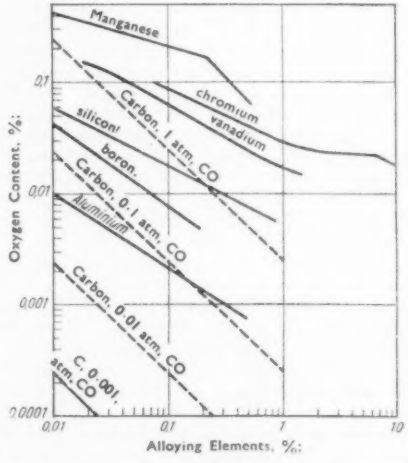

FIG. 4.—RELATIONSHIP BETWEEN THE OXYGEN DISSOLVED IN STEEL MELTS AND THE CONCENTRATION OF CERTAIN ALLOYING ELEMENTS[9].

ducts are always formed, which can never be completely removed from the melt. These endogenous inclusions, such as SiO_2 and other silicates or Al_2O_3, can be avoided through a reduction in the pressure, since deoxidation is then possible with carbon (*cf.* Fig. 4).

The slag inclusions which are termed exogenous, and stem from outside the melt, can, in fact, be influenced by a degassing process only in small measure. Their removal could well be more dependent on the mechanical flushing action through the liberation of gas.

Other Elements which Contaminate Liquid Steel

In this group should be counted metals such as copper, tin, lead, and so on. These elements can be distilled off under reduced pressure on account of their high vapour pressures or those of their compounds. At pressures between 10 and 1 torr, for instance, the boiling temperatures of the elements chromium, copper, and manganese lie below or immediately above the steel temperature.

2—METHODS FOR LARGE-SCALE VACUUM DEGASSING OF STEEL

It has already been mentioned that the capacity of vacuum melting furnaces used hitherto is inadequate for degassing the large quantity of steel which is required for a heavy forging ingot, for instance. Particularly in the production of large forging ingots does the need arise to employ a steel which is as free from gas as possible in order to obviate the danger of flakes.

The producers of heavy forgings are therefore the most active in work on the development of a practicable method of degassing large quantities of steel, and it is indisputably the honour of the collaborators of the Bochumer Verein to have created the first, and undoubtedly the best, plant for this purpose. Since their first experiments in the year 1950, 10 years have now elapsed. In this time a number of other processes have been developed, which will be discussed in the following text.

Degassing in the Ladle

Fig. 5 shows the experimental plant of Korbers, whose experiments at the Skoda Works in Pilsen in the years 1932 to 1935 were destined to fail on account of the weak vacuum pumps which were available at that time. It consists of a simple sealing of the teeming ladle, so that the steel tapped from

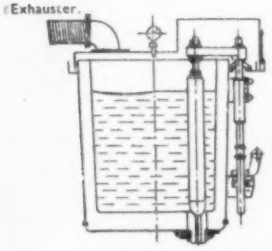

FIG. 5.—EXPERIMENTAL PLANT OF J. KORBERS FOR LADLE DEGASSING, 1932-35[8].

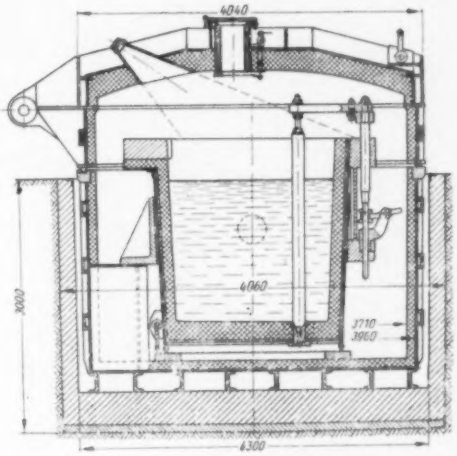

FIG. 6.—VACUUM VESSEL FOR LADLE DEGASSING IN THE SOVIET DNEPROSPETSSTAL' WORKS[13].

the furnace should have been able to be degassed in it. This is the first realization of the principle of degassing in the ladle.

The development of the ideas of Korbers is presented by an installation at the Enakievsk Works in the Soviet Union in 1952 to 1953, intended for the degassing of 16-ton ladles of Bessemer steel. With this plant vacuum pressures of only 75 to 140 torr could be attained, since at lower pressures the boiling action in the ladle was so strong that steel and slag slopped over the edge of the ladle. The duration of the degassing was 12 to 14 min.[13, 14]

In 1955, at the Dneprospetsstal' Works, two plants were installed for the degassing of 25-ton ladles of electric furnace steel (Fig. 6). This design makes it possible to place the whole ladle into the vacuum vessel, after which the lid is closed, and exhaustion commences. Similar plants are reported to have been installed[13] at this time in six further Soviet works also, *inter alia* at the Dzerzhinsk Works[14a].

At the Mannesmann Works in Huckingen a plant of this type has also been installed for the degassing of tube steels in the ladle in quantities up to 80 tons[15]. At the Dneprospetsstal' Works the steel was subjected to a vacuum of 30 to 35 torr for a period of 10 min. At this pressure the boiling action in the ladle attained a height of 300 to 400 mm. This strong boiling action, according to observations made in the electric furnace steelworks of the Soviet "Red October" Works,[16] goes down after a certain time in many charges, and continues to an undiminished extent only close to the wall of the ladle and around the stoppers.

This method has three important disadvantages, one of which has already been mentioned. On account of the violent boiling of the liquid steel in the ladle, the metal slops over the edge of the ladle, which does not, in fact, have an effect on the degassing. Essentially, the ferrostatic pres-

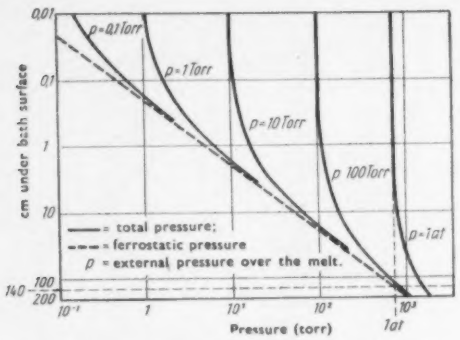

FIG. 7.—PRESSURE OF A STEEL MELT IN RELATION TO EXTERNAL PRESSURE[17].

sure in the ladle only permits degasification immediately under the surface of the bath.[17] As is evident from Fig. 7, even at a depth of 10 cm. below the surface of the bath the total pressure at a vacuum of 10 torr falls to about 60 torr.

On account of the short degassing period available and the absence of a thorough movement of the bath no fundamental equalization of the concentration is possible in the melt[8]. Hammarlund therefore proposed[1] that an induction stirring device should be installed near to the ladle, so that a movement of the bath in the vertical direction would be attained. For this purpose in Huckingen a flushing gas is introduced.[15] Also in an American works, Finkl & Sons Company, Chicago, which has a plant for degassing 35-ton ladles, helium is introduced into the lower part of the metal in the ladle by means of a tube with a stopper rod.[17a]. Finally, the third disadvantage is the subsequent pouring of the degassed steel with the access of air, so that a part of the degassing action achieved is once again reversed.

Stream-degassing in the Ladle

During the development work at the Bochumer Verein simple ladle degassing was likewise carried out, and the conclusion was reached that this method was only usable for steels with secondary applications. Significantly, more effective in degassing is the method of stream-degassing the metal in the ladle which was likewise developed in Bochum.[8, 17-23]

Fig. 8 shows that for this two ladles and a tundish are used. The actual pouring ladle, 14, is placed in the vacuum vessel, 13, which is closed and evacuated. The inlet aperture for the steel is sealed with an aluminium membrane, 17. On the lid of the vacuum vessel, 1, sits the tundish, 15, which is likewise sealed. After the steel is tapped, the tapping ladle, 18, is transported above the tundish and the stopper is opened. When the tundish is almost filled, its stopper, 19, is lifted, the steel flows downwards, melts the aluminium membrane, and passes into the pouring ladle standing in the vacuum vessel.

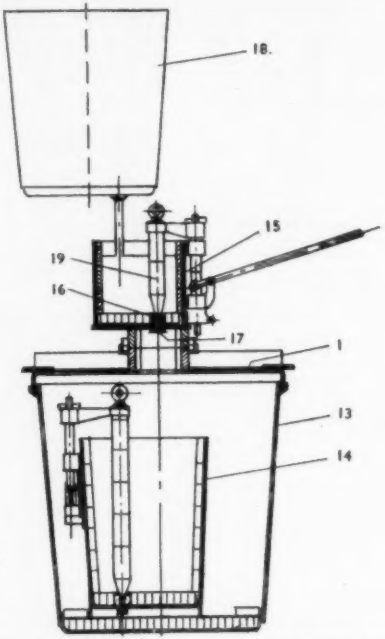

FIG. 8.—VACUUM VESSEL FOR STREAM DEGASSING IN THE LADLE: BOCHUMER VEREIN AG[18].

During the entry of the steel into the vacuum space the stream of liquid steel, under the action of the vacuum, is split up at an angle of almost 90 deg. (Fig. 9), so that the diameter of the stream of steel in vacuo is about 10 times that of the stream of steel cast in air, at about 1.5 m. below the outlet from the tundish.[2, 8] In this way, the surface of the steel is considerably increased, which again improves the efficiency of the degassing process. The whole process lasts, on a 40-ton charge for instance, 8 min., during which a loss in temperature of 30 deg. C. occurs[20].

For carrying out the same process the already mentioned Soviet "Red October" Works in Stalingrad[24] and the Open-Hearth Steelworks in Seraing[25] also have a vacuum degassing plant.

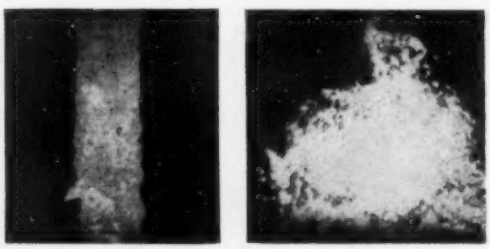

FIG. 9.—STREAM OF STEEL DURING CASTING IN AIR (LEFT) AND DURING VACUUM CASTING (RIGHT)[2].

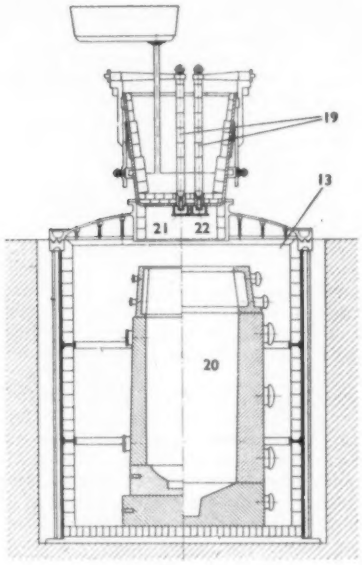

FIG. 10.—VACUUM VESSEL WITH INGOT MOULD PREPARED FOR VACUUM INGOT CASTING: BOCHUMER VEREIN AG[18].

Here the method of working is, naturally, the same as in Bochum. In Seraing a temperature loss of 50 deg. C. was observed.

The disadvantage of this method is the need for pouring in air both before and after vacuum treatment. In addition, on account of the velocity with which the metal flows through the plant, the same degree of degassing is not reached as with the method described below.

Vacuum Ingot Casting

Vacuum ingot casting, in fact, presents the most advantageous method of vacuum degassing. The steel passes from the tapping ladle in this instance via the tundish directly into the ingot mould (Fig. 10). The casting process is accordingly the same as during conventional casting in air. The tundish makes possible in the normal way the casting of very heavy ingots from several ladles. The great advantage as opposed to the method of degassing in the ladle is the direct pouring in vacuo.

This method was likewise developed by the Bochumer Verein.[8, 17-23] The working sequence is the same as has already been described earlier in this section except that, in place of the casting ladle, the ingot mould stands in the vacuum vessel. Of all degassing processes it has found the greatest response abroad for the production of large forging ingots.

Vacuum ingot casting is thus a subject of interest in the Soviet Union[26], in Czechoslovakia, in Belgium[25], and in the USA[27-33] (see Table 1). The European plants are installed for ingot sizes up to a maximum of 150 tons. The American plants permit the casting of ingots up to 225 tons in weight. Naturally, they can all also be used for stream-degassing into the ladle.

Vacuum Lift Process

The watertight patent protection of the degassing processes developed by the Bochumer Verein in West Germany forced the other works which were interested in steel degassing to embark on other means. Thus, the Dortmund-Hörder-Hüttenunion AG developed the vacuum lift process for the degassing of mass-produced steel.[19, 34-39]

The pouring ladle is placed under the heated vacuum vessel, provided with a suction column. The suction column is immersed into the steel bath and evacuation starts. Thereby the steel rises by about 140 cm. in the suction column and passes into the expanding degassing vessel. Later, the vessel is raised by 60 cm., so that the steel then only reaches up to the entry point into the degassing vessel. Thus, the quantity of steel which had previously been in the degassing vessel flows back

TABLE I.—*Some Data on Known Vacuum Degassing Plants.*

Country.	Works.	Plant manufacturer.	Max. ingot weight for degassing, tons.	Vacuum pressure used, torr.	Normal casting rate t./min.	Literature source.
Belgium	O-H Steelworks, Seraing	Leybold	42 42 100	4	3	25
Czechoslovakia	Lenin Works, Pilsen, and Vitkovice Iron and Steel Works	Zemag Zeitz	25 60	unknown	unknown	
Germany	Bochumer Verein	Leybold	35 35 150	1–10	up to 10	8 20 21
USSR	Urals Machinery Construction Works, Sverdlovsk	Sverdlovsk	30 120	3–8	~4	26
USA	US Steel Corp., Duquesne-Works	American Bridge Div. & Elliott Co.	220	0.5	3–10	29 30 32
	Bethlehem Steel Comp., Bethlehem	Bethlehem & Stokes Co.	7 225 225	<0.5	~8	2 31 32 33

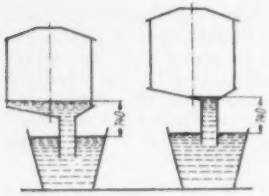

FIG. 11.—FILLING OF THE VACUUM LIFT MECHANISM AT CONSTANT PRESSURE AND VARYING IMMERSION DEPTH[9].

into the ladle, where it passes down to the bottom, as indicated in Fig. 11.

This cycle is repeated about 30 times. On the assumption that at each lift about 12 tons steel are sucked up, during the degassing of an 80-ton charge the steel flows four to five times through the degassing vessel. This whole process lasts about 20 min. The vacuum pressure amounts to between 100 torr at the outset and 10 torr at the end of the treatment.

A great disadvantage of this process is the high heat loss, which results in a drop in temperature of 85 deg. C. On this account, the degassing vessel must be electrically heated before and during operation. A further disadvantage is the repeated contact between the steel and the refractories of the degassing vessel. Furthermore, the steel must subsequently be poured in air. Since, however, the process was developed for large-scale steel production, the last two disadvantages may not be of such great importance.

The Circulation Degassing Process

The circulation degassing process developed at the Ruhrstahl AG in Hattingen in collaboration with the firm of W. C. Heraeus[40, 41] is based on a similar principle to that of the vacuum lift process. Fig. 12 gives an impression of this principle. A vacuum vessel with two tubes extended downwards is placed over the steel ladle by means of a crane and lowered into it, so that the ends of the tubes are immersed in the bath of steel. Evacuation then starts, whereby the steel is sucked up into the two tubes. Into the so-called rising tube argon is additionally fed (about 100 litres/min.).

Through the expansion caused by the heating of this flushing gas, and through the action of the gas escaping from the steel, the steel is split apart as it enters the degassing vessel, so that it is divided up into drops and, on account of its increasing density, falls back into the ladle through the second tube. In this way a continuous circulation is set up.

The rate of circulation is about 13 ton/min.[15]. The working pressure amounts to 1 to 2 torr. The degassing time is about 15 min. for 70 tons of steel. Despite the preheating of the vessel to 1,200 deg. C., a loss in temperature occurs, which amounts to about 30 deg. C. during the degassing of 100 tons of steel. The loss in heat can be balanced out by supplying heat from an induction heater.

With this method the erosive action of the steel on the refractory lining of the plants should be more prononunced than with the vacuum lift method. Here again the ingots must subsequently be cast in air.

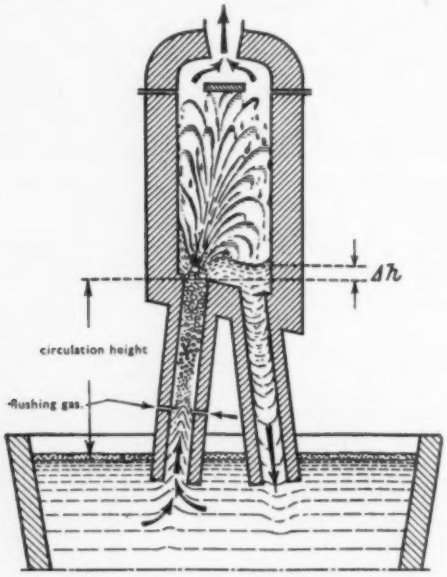

FIG. 12.—PRINCIPLE OF CIRCULATION DEGASSING[40].

Other Steel Degassing Methods

By variation of the vacuum ingot casting methods already described a series of further vacuum casting methods has arisen. In some instances they are only applicable for carrying out experiments and are therefore ill-suited for large-scale application.

Thus, according to the patent application of the Bochumer Verein,[18] it follows that the degassing vessel can contain likewise a steel casting mould, a group teeming stool, or even a continuous casting mould, in place of an ingot mould. At the "Red October" Works in Stalingrad the vacuum casting of group teeming stools has also been planned.[24]

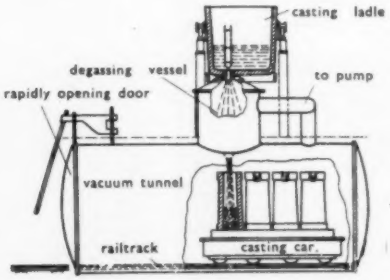

FIG. 13.—STREAM DEGASSING OF MILD STEEL. DIAGRAM OF PLANT FOR TOP POURING AT WORKS OF HOESCH-WESTFALENHÜTTE[42].

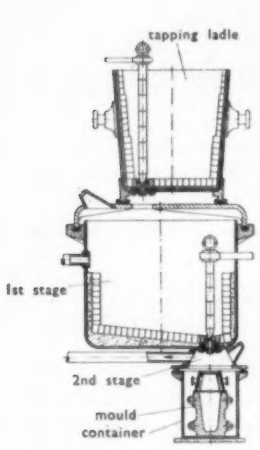

FIG. 14.—PLANT OF THE BOCHUMER VEREIN AG FOR CASTING SMALL INGOTS IN VACUO[23].

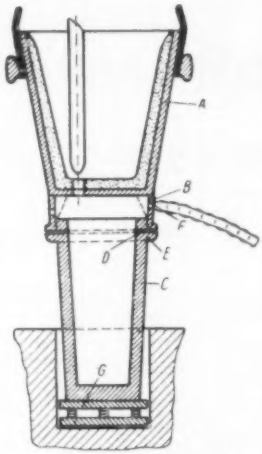

FIG. 16.—DEVICE OF THE PHOENIX - RHEINROHR AG FOR INGOT MOULD DEGASSING[43].

A somewhat different solution is presented by the plant installed at the Hoesch-Westfalenhütte (Fig. 13).[42] It consists of a tunnel through which the ingot moulds standing on the mould car can be run backwards and forwards. The steel running out of the tundish is collected in a dome and passes through a second outlet into the ingot mould standing below it. By this means the marked splitting up of the stream of steel during pouring is prevented. The working pressure amounts to 1 to 2 torr.

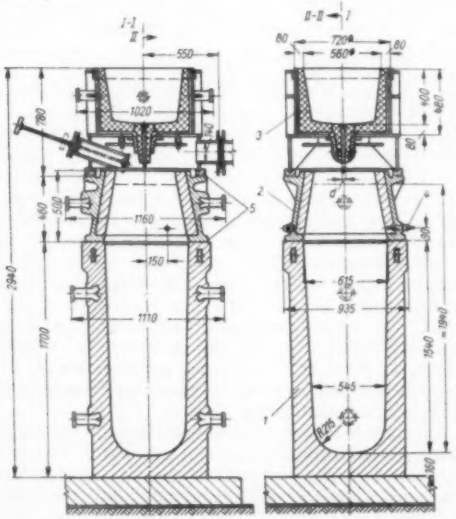

FIG. 15.—INGOT MOULD FOR VACUUM CASTING IN THE "RED OCTOBER" WORKS[24].

By this method the stream of steel is twice subjected to a vacuum. This is likewise true of the multi-stage degassing process of the Bochumer Verein (Fig. 14), the aim of which is to cast smaller ingots for rolling without the undesirable expansion of the stream of steel.[23]

Finally, methods for direct gas extraction from the ingot mould have been developed (Figs. 15 to 17), partly for experiments[3, 10, 16, 24] and partly for production applications.[43, 44] In a plant which has come into operation at the Lenin Works in Pilsen, the ingot mould is sealed with an aluminium plate and evacuated. The steel is filled into the tundish, melts through the aluminium plate and, in the manner already described, itself provides the seal. This plant served for experimental purposes.

The "Red October" Works in Stalingrad has a quite similar plant at its disposal (*cf.* Fig. 15). But here the sealing is taken over by a 1-mm. thick steel plate painted with a coating of graphite.

In Fig. 16 is reproduced the diagram of an ingot mould degassing plant of the Phœnix-Rheinrohr AG. Here the teeming ladle, which has a collar fitting on to the mould, is placed on the ingot mould. Then the mould is evacuated, and the ingot is cast. Nothing is yet known about the effectiveness of this method.

Finally, Fig. 17 makes clear the principle of the method employed at the Hoesch-Westfalenhütte for the degassing of deep-drawing steel in group teeming stools. In this instance degassing takes place after teeming. The degassing process therefore corresponds to degassing in the ladle.

(To be continued)

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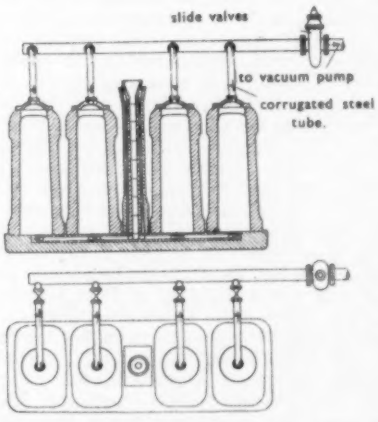

FIG. 17.—SIMPLE SUCTION DEVICE OF THE HOESCH-WESTFALENHÜTTE FOR TOP POURING OF MILD STEEL[44].

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Tin Mill Products at Port Kembla

THAT familiar household article the "tin can" has celebrated its 150th anniversary. In 1810, an Englishman, Bryan Donkin, made the first can from hand-beaten sheet iron; today, of course, millions are made daily all over the world.

In July, 1957, tinplate was produced in Australia for the first time at a hot-dip tinplate plant built at the BHP flat products division, Port Kembla. The annual capacity of the plant was 72,000 tons, a little over half Australia's total tinplate requirements at that time. Extensions to this plant, completed or in hand, will raise capacity to 118,000 tons per annum. Additionally, an electrolytic tinning line is being installed and will be in production by 1962. This, together with the hot-dip installations, will make Australia self-sufficient in the production of tinplate. In conjunction with the electrolytic tinning line a five-stand cold mill and a slitting line are being installed as part of the planned development of the flat products division. The latter unit will facilitate the large-scale production of cold-rolled slit strip at Port Kembla.

Tinplate from Port Kembla is sent to every Australian State. Previously, except for the requirements of New South Wales, all tinplate was despatched from Port Kembla by sea. In recent months, however, the NSW Government Railways has provided steel bogie-type louvre vans specially designed for the transport of tinplate. These have proved so successful that full 13-car trainloads are now despatched regularly to Victoria. Similar rail shipment is planned to Queensland in the near future.

Many Australian users have now developed the use of thinner tin-coated and, therefore, cheaper electrolytic tinplate for less critical applications. This, together with prospective development, provides sufficient market to warrant the installation of an electrolytic tinning line in Australia. A Halogen-type line has been chosen for Port Kembla, and it will be the first such line installed outside the USA. Until recently the Australian manufacture of narrow cold-rolled slit strip has been carried out at the Newcastle works of the Broken Hill Proprietary Company, Limited. The excess of demand over capacity has been partly met by adapting facilities available at Port Kembla for the limited production of restricted quantities of cold-rolled slit strip. It is planned to meet the full market requirements for this product by installing a slitting line and wrapping equipment at Port Kembla and making use of other facilities, existing or being installed there.

The development of the manufacture of tinplate by the steel industry at Port Kembla has been rapid and is still proceeding. Further major additions now in hand will raise total tinplate manufacturing capacity to 272,000 tons per annum. This is an increase of 277 per cent. in less than four and a half years.

Accidents in Coal Mines

STATISTICAL REVIEW OF TRENDS IN YORKSHIRE

*by J. Blunt**

Analyzing accident trends in the North-Eastern Division of the National Coal Board during the past five years, the author compares them with national statistics. The important causes of accidents are discussed and the lessons to be learned from them are outlined. An analysis is made of accidents according to parts of the body injured, showing that the highest per centage of injury is to the hands. Injuries according to age groups are also examined, indicating that the largest number of accidents occur to workmen over 35 years of age. Mr. Blunt's paper was presented at a meeting of the Yorkshire Branch of the National Association of Colliery Managers on November 15, 1960.

THE main part of this paper, dealing with analysis of accidents, is restricted to the five years from 1955 to 1959, but for the purposes of comparison, and in order to get a reasonable background to the subject, it is necessary to make some reference to previous history and this is done in the first part of the paper. In this respect, a period of 20 years, from 1940 to 1959, has been chosen. In this period, there were the war years, the immediate post-war period, the early years of nationalization, and the last five years.

In the main the analysis is based on accidents in the North-Eastern Division of the National Coal Board, but in the first part of the paper, for comparison purposes, reference is made to the position in respect of all divisions.

FATAL ACCIDENTS, 1940-1959

Table 1 shows the number of fatal accidents and rate per 100,000 manshifts in respect of the North-Eastern Division compared with the national figures. Fig. 1 shows the position in graphical form in respect of the accident rates.

It will be seen that the number of fatal accidents during the first five-year period, that is, the war period, totalled 751, an average of 150 per year, giving a rate of 0.40 per 100,000 manshifts. The number of fatal accidents for the whole country during this period was 4,061, giving a rate of 0.40 per 100,000 manshifts. During the next five years, 1945 to 1949, which includes the immediate post-war period and the early years of nationalization, the number of fatal accidents dropped considerably to a total of 417, an average of 83 per year, giving a rate of 0.25 per 100,000 manshifts, compared with a total of 2,611 for the country, which is a rate of 0.29 per 100,000 manshifts.

In the third five-year period, the total number of fatal accidents fell to 289, an average of about 58 per year, giving a rate of 0.17 per 100,000 manshifts. This compares with a total of 2,081 fatal accidents for the country and a rate of 0.24 per 100,000 manshifts. During the period under review, that is, 1955 to 1959, the total number of fatalities rose to 310, an average of 62 per year, and a rate of 0.20, compared with a total of 1,775 for the whole country and a rate of 0.21 per 100,000 manshifts.

The significant point about these figures is that the fatal accident rate in respect of the five-year periods fell consistently from 0.40 to 0.21 per 100,000 manshifts for the country as a whole and from 0.40 to 0.20 per 100,000 manshifts in the North-Eastern Division, the latter being an increase from 0.17 in the third five-year period.

It will be noted, therefore, that the general improvement in respect of the North-Eastern Division

TABLE 1.—*Fatal Accidents and Rate per 100,000 Manshifts for the Years 1940-59 in Respect of the North-Eastern Division, Compared with all Divisions of the National Coal Board.*

Year.	Fatal accidents.			
	Number.		Rate per 100,000 manshifts.	
	N.-E. Division.	All divisions.	N.-E. Division.	All divisions.
1940	162	923	0.42	0.43
1941	186	925	0.49	0.46
1942	157	877	0.42	0.43
1943	116	713	0.32	0.36
1944	130	623	0.37	0.33
1945	94	550	0.28	0.30
1946	84	543	0.25	0.30
1947	96	618	0.29	0.34
1948	69	468	0.21	0.25
1949	74	432	0.22	0.25
1950	60	476	0.18	0.28
1951	54	473	0.16	0.27
1952	61	409	0.18	0.23
1953	60	364	0.18	0.21
1954	54	359	0.16	0.21
1955	70	408	0.21	0.24
1956	60	318	0.19	0.19
1957	69	391	0.21	0.22
1958	43	315	0.14	0.19
1959	68	343	0.24	0.23

* Safety engineer, North-Eastern Divisional Coal Board.

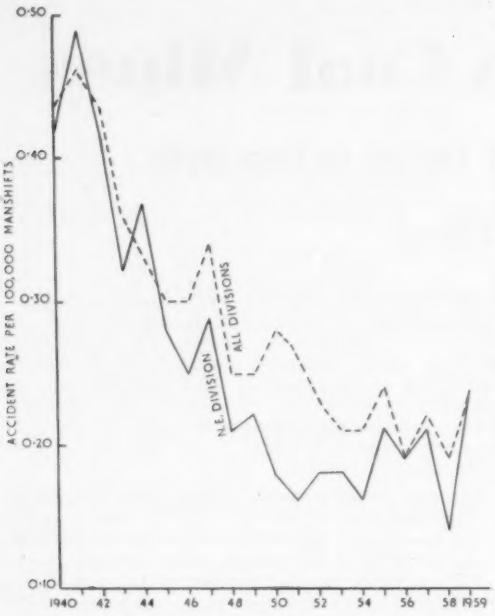

FIG. 1.—FATAL ACCIDENTS RATE PER 100,000 MANSHIFTS IN RESPECT OF THE NORTH-EASTERN DIVISION COMPARED WITH ALL DIVISIONS, 1940-1959.

has been more marked than for the country as a whole, in spite of the somewhat worse figures during the last few years. It will also be noted that the best year for fatalities was in 1958, when all time low figures of 43 for the North-Eastern Division and 315 for the country were recorded.

REPORTABLE NON-FATAL ACCIDENTS, 1940-1959

Serious reportable non-fatal accidents are those which are notified to HM District Inspector of Mines under Section 116 of the Mines and Quarries Act, 1954, and which result in serious bodily injury. The notification is made on M & Q Form No. 206, and serious bodily injury includes fractures of the skull, spine, pelvis, arm, forearm, thigh, or leg; dislocated shoulder, elbow, hip, knee, or spine; amputation of hand or foot or substantial part of a hand or foot; loss of the sight of an eye; other serious bodily injury, *e.g.*, internal hæmorrhage, burns, asphyxia, or other injury likely to endanger life, cause permanent incapacity for work, or substantially impair efficiency.

In addition to serious non-fatal accidents, some accidents, though not of a serious nature, are reportable to HM District Inspector of Mines under the Mines and Quarries (Notification of Dangerous Occurrences) Order of 1957. These are mainly accidents in connection with shotfiring and electricity. In recent statistics, they are shown separately from the serious reportable accidents. In the tables in this paper, however, in order to obtain a strict comparison, all the reportable accidents are included.

TABLE 2.—*Reportable Non-fatal Accidents and Rate per* 100,000 *Manshifts for the Years* 1940-1959 *in Respect of the North-Eastern Division, Compared with All Divisions of the National Coal Board.*

Year.	Reportable non-fatal accidents.			
	Number.		Rate per 100,000 manshifts.	
	N.-E. Div.	All divisions.	N.-E. Div.	All divisions.
1940 ..	483	3,237	1.26	1.52
1941 ..	515	2,990	1.36	1.49
1942 ..	486	2,809	1.29	1.38
1943 ..	416	2,596	1.13	1.31
1944 ..	492	2,553	1.41	1.34
1945 ..	444	2,353	1.33	1.30
1946 ..	416	2,335	1.25	1.28
1947 ..	485	2,446	1.49	1.36
1948 ..	506	2,391	1.51	1.30
1949 ..	401	2,269	1.21	1.31
1950 ..	385	1,982	1.19	1.17
1951 ..	348	1,903	1.04	1.10
1952 ..	413	2,073	1.21	1.17
1953 ..	360	1,907	1.07	1.10
1954 ..	324	1,825	0.96	1.06
1955 ..	360	1,850	1.10	1.08
1956 ..	389	1,731	1.21	1.03
1957 ..	365	1,900	1.10	1.10
1958 ..	371	2,037	1.22	1.24
1959 ..	355	2,025	1.20	1.35

Table 2 shows the number of reportable non-fatal accidents and the rate per 100,000 manshifts in respect of the North-Eastern Division compared with the national figures. Fig. 2 shows the position in graphical form in respect of the accident rates.

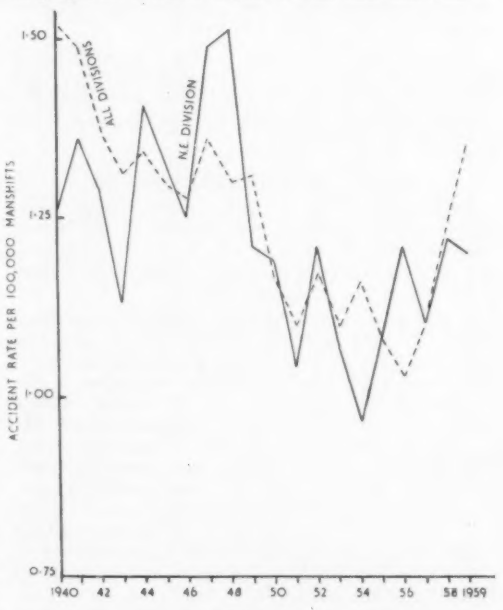

FIG. 2.—REPORTABLE NON-FATAL ACCIDENTS RATE PER 100,000 MANSHIFTS IN RESPECT OF THE NORTH-EASTERN DIVISION COMPARED WITH ALL DIVISIONS, 1940-1959.

It will be seen that the number of reportable accidents during the five-year period 1940-1944, inclusive, totalled 2,392, an average of 478 per year, giving a rate of 1.29 per 100,000 manshifts. The number of reportable accidents for all divisions during this period was 14,185, giving a rate of 1.41 per 100,000 manshifts. During the next five years, 1945-1949, the number of reportable accidents fell to a total of 2,252, an average of 450 per year, giving a rate of 1.35 per 100,000 manshifts, compared with a total of 11,794 for all divisions, which was equivalent to a rate of 1.31 per 100,000 manshifts.

In the third five-year period, that is, 1950 to 1954, the total number of reportable accidents fell quite considerably to 1,830, an average of 366 per year, giving a rate of 1.09 per 100,000 manshifts, compared with a total of 9,690 accidents for all divisions and a rate of 1.12 per 100,000 manshifts. During the five years under review from 1955 to 1959, the total number of reportable accidents rose slightly by an average of two per year to a total of 1,840, giving a rate of 1.16 per 100,000 manshifts, compared with a total of 9,543 for all divisions and a rate of 1.16 per 100,000 manshifts.

The average reportable accident rate fell consistently for all divisions from 1.41 to 1.31 and then to 1.12 during the first three five-year periods, while in respect of the North-Eastern Division the rate rose from 1.23 to 1.35 and then fell considerably to 1.09 during the same periods. In the most recent five-year period, the rates in both cases rose slightly to 1.16.

The general inference of these figures would appear to be that the North-Eastern Division has shown slightly better results in respect of reportable accidents than for the country as a whole. The lowest number of reportable accidents ever recorded in the North-Eastern Division was 324 in 1954. For all divisions the figure was 1,731 in 1956.

ACCIDENTS OF OVER THREE DAYS' INCAPACITY

The next classification of accidents is referred to as " accidents of over three days' incapacity," commonly known as " compensable " accidents. These accidents are those which result in the injured person being away from work for more than three days and for which compensation under the National Insurance Industrial Injuries Act is claimed. For the purpose of claiming benefit, the day on which the man is injured is counted as the first day and any Saturday is also counted as a further day. In the extreme case, it will be seen that a man may come under this category even though he only stays away from work on two working days.

Some light has now been thrown on the general trends which have developed over the last two decades and particularly over the last five years. There are grounds for some satisfaction in what has been achieved over the longer period in respect of fatal and serious accidents, but the general reversal in the trend of fatal accidents during recent years is very disconcerting. The general worsening of the overall accident rate, while disturbing, is affected by so many imponderables that we must keep it in its right perspective. This I have endeavoured to do by exposing some of the possible reasons. At the same time, we must not pass lightly over this question and every effort should be made to reduce the numbers of compensable accidents, even though many of the accidents be only of a minor nature.

In spite of the long-term improvements, none of us is happy with the position in respect of fatal and serious accidents. Some 310 fatal accidents in five years in this division have meant a tremendous amount of human suffering to the dependants of the deceased men as well as a great loss to the industry. It is, in fact, equivalent to the loss of a small pit. In a similar manner, the serious injury to 1,840 men in five years has meant a tremendous amount of suffering and lost time, bearing in mind that the average time from work in these cases is measured in months and not days and the fact that some of the injured men are unable to work again, while others often return only to lighter work.

LESSONS TO BE LEARNED

Having disposed of the essential background to the subject and thrown some light on the trends which have developed, particularly in the more recent years, I now come to the most useful part of the paper. Dealing strictly with the last five years, I want to present in more detail the more important causes of accidents and, particularly, the serious accidents. I also want to put forward certain suggestions, mainly arising out of the investigations which were made following the accidents and which might help in avoiding similar occurrences in the future.

Accidents Due to Falls of Ground, 1955-1959

Even the most casual study of the statistical position reveals that accidents from falls of ground still present the greatest problem. In some of the general improvements in the long term, this cause still accounted for about half of the fatal accidents and two fifths of the serious non-fatal accidents, the majority of which occurred at the face. The actual numbers were 135 fatal accidents, 652 reportable non-fatal accidents, and 58,314 compensable accidents.

Some 55 fatalities and 237 non-fatal reportable accidents were due to falls of roof at face workings. This category includes all the face except the roadheads and the waste area. On conventional faces, the blackest spot was in respect of fast ends or stable holes and in many cases investigations revealed that the roof had not been supported in accordance with the Support Rules, although the rules in themselves were adequate. In fact, in most of the reports in respect of the more serious accidents, there was evidence that the Support Rules in themselves were only inadequate in a relatively few instances, but they had not been

carried out in their entirety. The fast end or stable hole would appear to be very vulnerable in this respect, particularly when machines are being turned round, as there is often a tendency to remove too many supports too soon and to take short cuts by not setting sufficient temporary supports. Stricter supervision and insistence in carrying out the Support Rules would appear to be the answer in these cases.

It used to be fairly commonplace for many of the serious accidents on conventional faces to occur where the roof was good. There is now little evidence to support this as most of the accidents occurred in poor roof conditions, particularly in faulted ground, or where conditions were very difficult, often due to water. Better and more systematic methods of support in accordance with the Support Rules would appear to have had more effect in reducing the number of accidents in good conditions, but in difficult conditions, something more in the nature of additional supports is often required. In some cases, there is no doubt that the accidents were entirely due to lack of temporary supports or in not setting the permanent supports as soon as it was possible to do so. Improved systems of roof control have been instituted in many cases and this trend is growing. It should result in a reduction of accidents in the long term.

On power-loaded faces, a large proportion of the accidents were again in fast ends and stable holes and in many cases had no direct connection at all with the system of power loading. They happened in very similar circumstances to those which occurred on conventional faces. In fact, if one were to discount those accidents on power-loaded faces which were not connected with the system, the statistical figures would be very much in favour of the power-loading systems. Those accidents which did occur due to the power-loading systems were generally to men immediately around the power-loading machine itself or, in the case of prop-free-front systems, due to men venturing to the unsupported face side. Risks taken in this respect should be strongly resisted as such familiarity will certainly lead to accidents.

Falls of Face or Side at Face Workings, 1955-1959

Falls of face or side at face workings accounted for eight fatal accidents and 195 non-fatal reportable accidents. Most of these accidents were due to falling coal at the face and, as might be expected, the majority occurred in the thicker seams. The number of fatal accidents was not unduly high, but the number of reportable non-fatal accidents was exceptionally high. This is the normal trend of accidents in this category, as most of the injuries are below the head and increase in number from the body downwards to the legs. Foot accidents are not nearly as serious as they used to be, due, undoubtedly, to the fact that most men now wear safety boots.

On conventional faces, where a slightly greater proportion of the accidents occurred, the cause in most cases was due to failure to provide support to overhanging coal or failure to take down the overhanging coal or material. Most of these accidents might have been avoided by more care and stricter compliance with the Support Rules.

There were 28 fatal accidents and 123 non-fatal reportable accidents due to falls at roadheads (Table 3). Considering the number of men at risk in the vicinity of roadheads, this is undoubtedly the blackest spot. The majority of the accidents occurred either from roof falling ahead of the ripping or due to falls from the ripping face itself. A high standard of roof control is essential at every roadhead, and to obtain this the supports should be set as early as practicable.

In his reports for 1958 and 1959, HM Divisional Inspector of Mines makes particular note of the fact that of all the roadhead accidents which occurred, chocks were not in use in about 90 per cent. of the cases. It would appear that there is a lesson to be learned here, particularly as chocks

TABLE 3.—*Number of Fatal and Reportable Non-fatal Accidents at Roadheads for the Years* 1955 *to* 1959, *inclusive, in the North-Eastern Division, NCB.*

	1955.		1956.		1957.		1958.		1959.		Total.	
	No.	Rate per 100,000 manshifts.	No.	Rate per 100,000 manshifts.	No.	Rate per 100,000 manshifts.	No.	Rate per 100,000 manshifts.	No.	Rate per 100,000 manshifts.	No.	Rate per 100,000 manshifts.
Fatal Accidents—												
FALLS AHEAD OF RIPPING:												
Roof	2	0.01	3	0.01	2	0.01	4	0.02	2	0.01	13	0.01
Face or side	1	—	—	—	—	—	—	—	—	—	1	—
Falls from ripping face (side)	3	0.01	1	0.01	4	0.02	2	0.01	2	0.01	12	0.01
Falls outbye ripping face (roof)	—	—	—	—	—	—	—	—	2	0.01	2	—
Total falls at roadhead	6	0.02	4	0.02	6	0.03	6	0.03	6	0.03	28	0.02
Reportable Non-fatal Accidents—												
FALLS AHEAD OF RIPPING:												
Roof	9	0.04	7	0.03	8	0.03	5	0.02	8	0.04	37	0.03
Face or side	1	—	5	0.02	5	0.02	4	0.02	4	0.02	19	0.02
Falls from ripping face (side)	8	0.03	9	0.03	11	0.04	8	0.03	9	0.04	45	0.03
Falls outbye ripping face (roof)	4	0.02	2	0.01	3	0.01	7	0.03	6	0.03	22	0.02
Total falls at roadhead	22	0.09	23	0.09	27	0.10	24	0.10	27	0.13	123	0.10

are in use in very many more than 10 per cent. of the roadhead supporting systems.

Investigations into some of the accidents revealed an insufficiency of supports or lack of horse heads at face ripping lips. There was also evidence in a number of cases to suggest that ripping had been allowed to fall behind, very often due to difficulties caused by absenteeism. In some cases, there was also evidence to suggest that ripping was not being carried out at the time best suited to conform to good mining practice and sometimes this was due to the ripping being carried out at a time to suit the convenience of the men themselves. These are often difficult problems to solve, but they undoubtedly have a bearing on the accident position.

Falls in Wastes, 1955-59

Twenty-seven men were killed and 41 sustained non-fatal reportable injuries due to falls in wastes. Considering the relatively small number of men who are engaged in waste work, this operation is undoubtedly the one with the worst serious accident record. Most of the accidents were due to men either venturing under unsupported ground or to the failure to use a method or device which would enable withdrawal of supports to be carried out from a safe position. Experienced men often become very careless and tend to trade too much on their experience with the result that they take short cuts. This type of work does not allow for anything but the strictest of discipline and short cuts inevitably lead to accidents, often of a very serious nature.

The manager's Support Rules require him to specify and, if necessary, to illustrate the system of withdrawing supports. It is not sufficient to leave the detail to the workmen concerned, even though they be experienced workmen. It is necessary to specify the sequence of operations and explain, preferably with the aid of illustrations, how the operation can be effected from a safe distance. Needless to say, efficient devices should be available for the men to use. Underground officials have a very special duty in seeing that the strictest of discipline is maintained and that any divergence from this procedure is taken up most vigorously.

Most of the accidents occurred on faces where strip packing was practised, and while one would expect this to be so, the number was proportionally much higher than on caved and solid-stowed faces. It may be that on caved faces withdrawal is effected more systematically as the men usually start in the middle of a waste and proceed in opposite directions until they reach the roadside packs. Where the system is strip packing, there is often a history of shortage of packing materials prior to the accident and this inevitably leads to risks being taken under unsupported ground. Again, there are instances where chocks were advanced some time before the props, so that the roof lost its main support shortly before the waste drawers worked beneath it. In some instances, there was evidence of bad systems of withdrawal in that wastes were not drawn off in a systematic manner. It would appear that more use might be made of the caving system where conditions are suited to it.

There was evidence in a few cases that the packing and drawing off had not been carried out at the time best suited to conform to good mining practice. This had been done to meet the wishes of men who wanted their social pleasures to take precedence over their shift times. While not wishing to decry this sort of thing where it can be suitably arranged, it is important that it should not interfere with good mining practice and thus lead to unnecessary accidents.

Falls on Roadways

There were 17 fatal accidents and 56 non-fatal reportable accidents due to falls on roadways. As one would expect, the majority of these accidents were to persons engaged on repairing roadways. Several were due to a lack of temporary supports while repair work was in progress, and the reports on many of the accidents suggested a lack of personal responsibility. There were still a few accidents due to the breaking of tram rail girders, but these should gradually disappear as the use of this type of support is slowly being replaced. On the whole, the long-term trend in accidents due to this cause has improved considerably and the better standard of support of roadways must have had a bearing on it.

Haulage and Transport

There were 75 fatal and 418 non-fatal reportable accidents due to haulage and transport operations. Reference to the tables shows that there has been a genuine improvment in this category and particularly in 1959 when the number of persons killed and seriously injured (nine and 67, respectively) was the lowest ever recorded in the North-Eastern Division. The trend in respect of compensable accidents also showed a general improvement.

The analysis of accidents showed that many resulted from runaway tubs and derailments, or occurred while coupling or uncoupling tubs. Some were due to bad practices on the part of the haulage workers concerned, while the use of simple safety devices, such as coupling blocks and hooks, would certainly have prevented others. The encouragement of good haulage practice by those in charge of haulage operations and the carrying out of instructions by all who are engaged on haulage work would undoubtedly help in reducing the number of haulage accidents.

The most disturbing feature in respect of accidents falling within this category is that an unusually large proportion of the accidents occurred on locomotive haulages, due either directly to the locomotives themselves or in connection with the manipulation of mine cars. For instance, in 1959, there were no fatalities in the division on endless rope haulages, a most satisfying position, but eight out of a total of nine fatalities due to haulage operations occurred on locomotive haulages. This is certainly very disquieting.

Over the period under review, there were several accidents due to the drivers on open-cab type locomotives being crushed against roof supports and a number due to locomotives and their trains running away on gradients, sometimes due to the maximum permitted load being exceeded. There was also a number of most simple accidents to persons working or walking on locomotive haulage roadways and being run down by locomotives. It is important that the greatest care is exercized by drivers of locomotives and by persons working or travelling on locomotive haulage roads, and it is essential that officials insist on the strictest discipline. This type of haulage should give an increased standard of safety with reasonable care and I am sure that in the long term it can be made to do so.

Shotfiring Accidents, 1955-1959

There were five fatal accidents and 192 reportable non-fatal accidents due to shotfiring. It is appreciated that many of the accidents in this category were not of a serious nature although reportable, but it is often only a matter of good fortune that a minor accident from this cause is not more serious. It is particularly regrettable that the causes of almost all the accidents can be attributed to some contravention of the Explosives Regulations, 1956, by the shotfirer, or some failure to exercize ordinary caution.

About 75 per cent. of the accidents was caused by blows from projected material in circumstances where there had been an error of judgment in determining the danger zone of a shot or where persons had not withdrawn to proper shelter. In this respect, the shotfirer has a big responsibility in that, if anybody is injured, it is almost certain that the regulations have been contravened. It is, therefore, important to err on the side of safety in fixing the danger zone and in choosing the place of shelter and to remember that distance alone is not necessarily a sign of protection, especially if the place of shelter is in direct line with the shot being fired. On the other hand, it is not necessarily safe to shelter behind some solid obstacle near to a shot, for there is always a danger of a ricochet or of material being projected violently enough to penetrate a shelter at close quarters. Moreover, shelter that is adequate for one shot might not be adequate for a shot containing a heavier charge or fired under different physical conditions. Every shotfirer should bear in mind that Regulation 35 (2) of the Explosives Regulations, 1956, imposes on him the responsibility of ensuring before a shot is fired that all persons have either withdrawn from the danger zone or have taken appropriate shelter. This responsibility is not discharged merely by instructing men to take shelter at their discretion, nor by instructing men to withdraw. The shotfirer must see for himself that the shelter taken is, in his own judgment, adequate or that men have actually withdrawn from the danger zone.

As most of the more serious accidents due to shotfiring occurred during the firing of ripping shots, it is important that particular attention be paid to shotfiring in gates. Probably the best method of achieving this is by insisting that shotfiring takes place from a properly constructed manhole, which is, in turn, protected from a ricochet by some form of safety gate.

About 5 per cent. of the accidents was due to the shotfirer failing to post a sentry and a further 5 per cent. due to the sentry failing to carry out his duties in a proper manner. About 12 per cent. of the accidents were due to bad practices on the part of the shotfirer. The remaining few accidents were either due to defective equipment or were not satisfactorily explained.

Ignitions of Firedamp, 1955-59

Seventeen persons were killed and 32 sustained non-fatal reportable injuries due to ignitions of firedamp. All the 17 fatalities resulted from four explosions, one of which occurred in 1957 and three in 1959. It was very fortunate that the explosions did not result in a greater loss of life and it serves as a reminder to us that the danger of explosion is still with us. These incidents have been the subject of special reports and the findings are well known and cannot be detailed in a paper of this sort.

The fundamental lessons, however, would appear to be to try and prevent any accumulation or layering of gas by good ventilation and more careful inspection and supervision. To prevent a gas explosion initiating a coal dust explosion, a high standard of cleaning up and stone dusting is necessary and the installation of stone dust barriers in accordance with the new Regulations is an essential second line of defence.

There were also 14 ignitions of gas which did not result in any fatalities. Most of these were either due to shotfiring or coal-cutting operations. Those which occurred due to coal-cutting operations were generally due to the machine picks striking hard material, generally below the seam, and some of them might have been avoided if wet cutting had been practised at the time.

An innovation which should greatly diminish the possibility of ignitions due to shotfiring at ripping lips is the system of injection of foam into the shotholes before shotfiring, which has been developed in No. 5 Area of the North-Eastern Divisional Coal Board. There would appear to be a future in this development.

Coal Cutters and Mechanical Loaders, 1955-1959

There were seven fatal accidents and 54 reportable non-fatal accidents in connection with coal cutters and mechanical loaders. Although these numbers are not high numerically, many of the non-fatal accidents were of a permanent or distressing nature. The majority of them were in connection with conventional coal-cutting machines, the two most common causes being men coming into contact with the moving picks and the machines kicking out while jibbing in, or due to striking hard material in the cut. The greatest care is necessary by the operators and those working near

to coal-cutting machines in order to prevent such accidents.

Emphasis has already been placed on the increase in machinery accidents in connection with power-loading machines in recent years compared with conventional machines. One of the greatest dangers, and the cause of the most severe injuries, is the operation of power loaders and coal cutters on top of panzer-type conveyors. Coal from stable holes has to pass underneath the power-loading machine, and very often large lumps of coal and materials, such as props, bars, and chock pieces, become fast under the machine and sometimes lift it off the top of the conveyor. The greatest care is necessary by all who use these machines and it is essential that there should be a means of quickly stopping both the conveyor and the power loader. There are several types of signalling systems in use, some of which are based on signalling only, while others are used to stop automatically the conveyor motors. There is also a system where the operation of a pull wire stops both the conveyor and power loader simultaneously. Even so, there is always the possibility that the panzer conveyor will continue to run several yards and this is often sufficient to cause an accident. There is scope for improvement both in signalling systems and automatic means of preventing men being taken under power-loading machines by the panzer conveyor.

The Mining Research Establishment of the NCB is carrying out research into this problem, but in the meantime it is up to everyone concerned to see that the greatest care is exercized by all persons who work in the vicinity of these machines.

Shaft Accidents, 1955-1959

There were 19 fatal accidents and 48 non-fatal reportable accidents in connection with shafts. The trend in this respect has been towards an increase in accidents. Working in shafts is potentially very dangerous, and from time to time very many experienced shaft men have been killed. Often these accidents have been due to shaft men not using safety harnesses or having too little regard for their own personal safety. These men cannot be supervized all the time and the remedy is largely in their own hands.

Occasionally, with remarkable regularity, serious accidents occurred, resulting from mistakes or confusion with signals. The strictest discipline is necessary by all persons connected with shaft operations.

Miscellaneous Causes, 1955-1959

Under miscellaneous causes, I am grouping accidents due to stumbling, falling, and slipping; those due to the use of tools; by falling objects, and in the handling of supplies. This group resulted in nine fatalities, 174 non-fatal reportable accidents, and almost 110,000 compensable accidents.

Stumbling, falling, and slipping accidents accounted for the largest number of accidents in this group. The majority were as a result of stumbling over obstructions mainly on the roadways, but sometimes on smooth surfaces or due to irresponsible behaviour, particularly when leaving paddy trains. While carelessness was the primary cause of many of the accidents, many were also caused by obstructions and general untidiness underground. Greater attention to tidiness on the part of all concerned would go a long way to prevent such accidents. Care should be taken to see that materials are not left lying about on the side or between the tub tracks of roadways, especially those roadways along which men regularly travel. Similarly, working places, such as coupling and loading stations and the approaches to the face, should be kept free from obstruction.

In this respect, it is interesting to note that Section 47 of the 1911 Act merely provided that every haulage road should be kept clear, as far as possible, of pieces of coal and other obstructions, but Section 34 of the 1954 Act imposes an absolute and continuing obligation on the manager to see that the floor itself is kept not only in good repair but also from potential dangers upon it.

Surface Accidents, 1955-1959

Thirty eight men were killed and 208 reportably injured in accidents on the surface during the period under review. While the trend has shown a slight improvement, the numbers are relatively high compared with underground accidents when account is taken of the differences in working conditions and the general improvement which has taken place at many pits following reconstruction of the surface plant. One of the disquieting features is the number of fatal and serious accidents which have occurred to men employed by contracting firms. Investigation into some of these accidents revealed that risks are often taken which can only lead to accident in the long term. While contractors' men are working on colliery premises, the colliery manager has an over-riding responsibility for their safety. The colliery engineer and the safety officer can help in this respect by keeping an eye on these men.

Haulage and transport operations accounted for more than 25 per cent. of the accidents and stumbling, falling, and slipping for almost 25 per cent. of the accidents. It would appear that carelessness and the lack of personal responsibility was the underlying cause of the majority of these accidents.

ANALYSIS OF ACCIDENTS ACCORDING TO PARTS OF THE BODY INJURED

Table 4 shows the part of the body injured in accidents of more than three days' incapacity during the five-year period 1955-59. As one would expect, the highest percentage of accidents was to the hands (26.4 per cent.), followed closely by accidents to the body (25 per cent.). Leg injuries accounted for 18.4 per cent. and injuries to arms and feet came next with 9.7 per cent. and 9.2 per cent., respectively. The percentage of accidents to the head, face, and spine was very low, being 3.5, 2.1, and 1.3, respectively.

TABLE 4.—*Part of Body Injured in Respect of Accidents of Over Three Days Incapacity for the Years 1955 to 1959, inclusive, in the North-Eastern Division, NCB.*

Cause of Accident.	Head.	Face.	Eyes.	Body.	Spine.	Arms.	Hands.	Legs.	Feet.	Total.
Underground:										
Falls of roof at working face	1,729	613	433	7,470	538	3,977	10,462	6,347	2,843	34,412
Falls of face or side of working face	396	225	221	2,923	125	1,944	4,024	4,398	1,830	16,086
Falls of roof or side on roads	650	174	111	1,748	95	971	1,955	1,239	873	7,816
Breakages of ropes or drawgear	—	—	—	4	—	3	1	2	1	11
Mechanical haulages (incl. self-acting inclines)	570	355	170	5,257	242	1,975	7,491	3,167	1,730	20,957
Horse haulages	57	29	8	318	8	112	266	291	147	1,236
Hand and gravity haulages (excl. self-acting inclines)	18	4	7	430	36	71	335	219	99	1,219
Conveyors and gate-end loaders	141	94	127	1,398	49	583	2,186	886	532	5,996
By machinery	67	83	87	548	23	319	1,207	399	259	2,992
Use of tools or appliances	382	710	5,809	2,473	79	1,452	3,961	1,129	464	16,459
Stumbling, falling, or slipping (excl. accidents in connection with haulage operations)	596	344	212	10,405	548	2,500	2,699	10,367	3,093	30,764
Explosion or ignition of firedamp or coal dust	—	22	—	24	—	—	—	—	—	46
Suffocation by natural gases	1	—	—	2	—	—	—	—	—	3
Underground fires	—	—	1	3	—	1	—	—	—	5
Shafts	8	3	6	76	—	6	16	48	9	172
Explosives—blows from projected material, etc.	15	24	17	52	1	35	6	28	2	180
Electricity	—	2	—	6	—	2	15	—	—	25
All other underground accidents	2,865	1,999	2,476	20,662	1,105	7,306	23,257	12,003	7,273	78,946
Underground totals	7,495	4,681	9,685	53,799	2,849	21,257	57,881	40,523	19,155	217,325
Percentage	3.4	2.2	4.5	24.8	1.3	9.8	26.6	18.6	8.8	100.0
Surface:										
Railways and sidings	76	39	19	501	21	144	390	189	105	1,484
Tramways or tubways	77	28	12	849	32	287	834	421	260	2,800
Machinery	32	12	42	188	8	102	459	125	108	1,076
Stumbling, falling, or slipping (excl. haulage accidents)	170	92	38	1,997	110	507	581	1,602	786	5,883
Electricity	—	3	—	4	—	3	7	—	—	17
All other surface accidents	418	249	776	2,464	149	842	3,127	1,125	1,618	10,768
Surface totals	773	423	887	6,003	320	1,885	5,398	3,462	2,877	22,028
Percentage	3.5	1.9	4.0	27.3	1.5	8.6	24.5	15.7	13.0	100.0
Total	8,268	5,104	10,572	59,802	3,169	23,142	63,279	43,985	22,032	239,353
Percentage	3.5	2.1	4.4	25.0	1.3	9.7	26.4	18.4	9.2	100.0

There is no doubt that much good has been done in the last few years by the use of safety equipment and clothing both in reducing the number of accidents and their severity. The greatest scope for improvement in this respect is undoubtedly in the wearing of gloves. It is not so long ago that the use of gloves was confined to a few special jobs, but in recent years their use has become more widespread. Better designed gloves are now available giving greater flexibility for tasks where the movement of the fingers is essential. Experiments are also being carried out with types of p.v.c. gloves, and these are encouraging. Every effort should be made to persuade men to wear gloves as there is considerable scope for reducing accidents by extending their use.

Accidents to the feet have been reduced and their severity minimized by the wearing of safety boots and this is reflected by the fact that the percentage of foot accidents is now lower underground than on the surface. More widespread use of safety boots or safety shoes by surface workers should be encouraged.

So far as head injuries are concerned, it is gratifying to note that the percentage of such injuries is less than it was even five years ago, and it is astounding to find that the percentage of head accidents to surface workers is now greater than to underground workers. More than 90 per cent. of underground workers in the division wear safety helmets and the Divisional Consultative Council has instituted a campaign through the pit consultative committees to encourage every underground worker to wear a safety helmet by the end of this year. So far, this campaign is meeting with excellent results. With regard to head injuries to surface workers, it is possible that greater use could be made of safety helmets by wagon lowerers and other men who work in the vicinity of screening plants and places where they are liable to be struck by falling materials.

ACCIDENTS ACCORDING TO AGE GROUPS

Table 5 shows the number of fatal accidents during the period 1955-1959, inclusive, in the various age groups compared with the numbers of men employed in those age groups. Figures on a percentage basis are also given for stricter comparison.

The most important and encouraging point is that in respect of fatal accidents the under 21s show the best results. Even if one discounts the fact that many of these boys are employed on work which is relatively safe, one cannot but feel that training might have had some bearing on the results. This trend is again borne out in the 21 to 25 age group,

TABLE 5.—*Fatal Accidents by Age Groups for the Years 1955 to 1959, Inclusive, in the North-Eastern Division, N.C.B.*

Age group.	1955.			1956.			1957.			1958.			1959.			Total.		
	No.	Per cent. of total accidents.	No. of men employed.	Per cent. employed	No.	Per cent. of total accidents.	No. of men employed.	Per cent. employed	No.	Per cent. of total accidents.	No. of men employed.	Per cent. employed	No.	Per cent. of total accidents.	No. of men employed.	Per cent. employed	No.	Per cent. of total accidents.	No. of men employed.	Per cent. employed
Under 21	4	5.7	13,372	9.7	3	5.0	13,264	9.7	5	7.3	13,570	9.8	2	4.7	12,799	9.4	—	—	11,198	8.6	14	4.5	12,842	9.5
21 to 25	2	2.9	9,979	7.2	4	6.7	10,333	7.6	6	8.7	11,256	8.2	3	7.0	11,876	8.7	2	2.9	11,303	8.8	17	5.5	10,974	8.1
26 to 30	3	4.3	13,912	10.2	6	10.0	12,485	9.2	6	8.7	11,957	8.7	6	14.0	11,217	8.3	2	2.9	10,304	7.9	23	7.4	11,953	8.8
31 to 35	8	11.4	16,995	12.3	8	13.3	16,844	12.3	4	5.8	16,544	12.0	7	16.3	15,822	11.7	8	11.6	14,200	10.9	35	11.3	16,082	11.9
36 to 40	8	11.4	14,279	10.4	6	10.0	14,472	10.6	7	10.1	15,034	10.9	3	7.0	15,521	11.4	8	11.7	14,671	10.9	36	11.6	14,995	11.1
41 to 45	8	11.4	16,957	12.3	2	3.3	16,175	11.9	11	15.9	15,887	11.5	3	7.0	15,040	11.1	12	17.7	15,097	11.0	37	11.9	15,632	11.5
46 to 50	15	21.5	16,048	11.6	4	6.7	16,021	11.7	4	5.8	16,213	11.8	4	9.3	15,977	11.8	13	19.1	15,291	11.3	40	12.9	15,910	11.7
51 to 55	10	14.3	14,975	10.9	9	15.0	14,933	11.0	8	11.6	14,845	10.8	7	16.3	14,891	11.0	7	10.3	13,944	10.3	41	13.3	14,918	11.0
56 to 60	5	7.1	10,941	7.9	6	10.0	11,520	8.4	10	14.5	12,107	8.8	1	2.3	12,439	9.1	6	8.8	13,029	10.0	28	9.0	12,008	8.9
61 to 65	5	7.1	6,674	4.8	7	11.7	6,820	5.0	8	11.6	6,904	5.0	4	9.2	7,095	5.2	4	5.9	7,295	5.5	28	9.0	6,920	5.1
Over 65	2	2.9	3,679	2.7	5	8.3	3,521	2.6	—	—	3,467	2.5	3	7.0	3,051	2.3	1	1.5	2,542	2.0	11	3.6	3,258	2.4
Total	70	100	137,814	100	60	100	136,391	100	69	100	137,818	100	43	100	135,671	100	68	100	129,769	100	310	100	135,492	100

which shows the second best results and the 26 to 30 age group, which shows the third best results. The 31 to 35 age group shows slightly better than average, but then the trend is reversed. In the four age groups 36 to 55, the results are progressively worse.

This is disquieting when one considers that these men are probably the most experienced, although the underlying cause might be the fact that these men are employed on the most skilled classes of work. The older men in the age groups 61 to 65 and over 65 have the worst record of all and it may be that some of the lighter jobs which they are put to are not really suitable. There have been numerous instances where older men have been killed or seriously injured while coupling or manipulating tubs, or while cleaning up at busy loading points.

Every care should be taken to see that the older men are not put on jobs where quick action might be needed and where mistakes might have serious results. This is a very difficult problem, but it is one deserving of special consideration, especially as these men are generally very conscientious and willing to help in any way possible.

OUTLOOK FOR THE FUTURE

In this paper, I have attempted to cover a very large field, so that it has been impossible to deal with any particular aspect except in the broadest terms. All aspects of safety are always given priority by managements and they have much to be proud of in what has been achieved. Accident prevention is no one-man-show, it requires the constant attention of the colliery manager who must have full co-operation from his safety officer and junior officials. Junior officials can help more than anyone else as they are constantly in touch with their workmen and they have the opportunity to insist on safe practices being carried out at all times.

It is true to say that the majority of accidents can be classed as avoidable with reasonable care. By good supervision and by attempting to instil into every workman the importance of working in a safe manner and the necessity of feeling a genuine responsibility for his own safety, better results can be obtained.

Considerable help has been given by the consultative bodies and even more use can be made of the accident sub-committees, which are now functioning at almost all pits. There is evidence that many of those committees are doing excellent work. No reference has been made to the accident position during the current year and it is only fitting that some brief reference should be made to the position before concluding this paper. In respect of both fatal and non-fatal reportable accidents, the position in 1960 has very much improved, and I hope that this trend will continue, for I am sure that it is well deserved.

The author would like to thank Mr. C. Machin, the production director of the North-Eastern Divisional Coal Board, for permission to publish

this paper. The views expressed in the paper are those of the author and not necessarily those of the National Coal Board.

DISCUSSION

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The AUTHOR replied that for fatal accidents, the rate per 100,000 tons was 0.07 on power-loaded faces compared with 0.06 on other faces. For reportable accidents, the rate was 0.37, compared with 0.39 on other faces, and in respect of all accidents the rate was 39.7, compared with 52.0 on other faces. The position, therefore, was very much better when looked at from this standpoint, but the author emphasized that the rate on a manshift basis was the one which reflected the position in the fairest manner.

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MR. H. ALLEN said the author had highlighted the figures on compensable accidents, which showed a very marked increase over the period under review and asked if he had considered what the effect on the compensable accident rate, based on 100,000 manshifts would be, if there was a reduced number of men employed on the less hazardous jobs, say, on the surface. If, for example, due to reconstruction, the number of men employed on the surface was considerably reduced and the number of underground accidents remained constant, an increase in the compensable accident rate based on 100,000 manshifts would result in giving a false picture.

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The AUTHOR agreed there was something to be said for Mr. Allen's point and they had already done some splitting up of accident rates for the various categories. The information had to be somewhat restricted as too many statistics involved too much additional work and might only complicate the issue without serving a useful purpose. The accident prevention scheme had been purposely omitted to limit the length of the paper. Also, the experiment was still in its early stages and it was still too early to draw conclusions from it.

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Experimental practice at Fords employs a 50 per cent. hot metal charge with emphasis on the speed of both cold and especially hot metal charging, combined with extremely high firing rates through the hot iron addition, and the extensive use of oxygen thereafter. The melting shop consists of 10 furnaces—nine furnaces tapping 200-ton heats and one furnace tapping 400 tons into two ladles. The large furnace and one of the small furnaces are equipped with basic roofs and oxygen roof lances.

The furnaces are serviced on the charging side by two 125-ton hot metal cranes, one 15-ton stock crane, and four 12-ton charging machines. Hot metal is handled from one end of the shop either direct from blast-furnace ladles or from two 500-ton mixers. Two portable backwall machines are employed for furnace fettling.

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The total metallic charge in this heat amounts to 445,000 lb. the charge consisting of:—Burnt lime, 6,500 lb.; scrap, 225,000 lb.; hot metal, 220,000 lb. The total cold charge is contained in 13 trucks and is delivered to the furnace in one drag.

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The roof lances are lowered approximately 1 ft. through the roof during the charging period, supplying 30,000 cu. ft. of natural gas, mixed with 48,000 cu. ft. of oxygen per hour. This represents

a total input of 190,000,000 B.t.u./hr. Total cold charging time on this heat amounted to 23 min.

Upon completion of charging, the roof lances are lowered to a point 2 ft. above the scrap and are later progressively lowered to follow the scrap as it melts down.

Doors are banked with a frontloader immediately upon finish charging. The frontloader is protected from the heat in order to continue maximum firing rates during the door banking operation. The doors are banked in 9 min. with an elapsed time of 32 min. from start to charge.

Hot metal is ordered before charging is completed and the addition is made immediately upon completion of door banking. This early addition of hot metal is one of the significant parts of the practice. In spite of the high firing rates employed, melting has not progressed nearly to the normal degree at the time of addition. Two ladles of hot metal are required and the total time of addition is 11 min. The elapsed time from start of charge to finish hot metal addition is 43 min.

Finishing and Refining

Immediately after the addition of hot metal, the natural gas is turned off the roof lances, and they are lowered as rapidly as melting permits to a position 4 in. above the bath. This lance level, with 48,000 cu. ft. of oxygen per hour, is maintained throughout the remainder of the heat.

The lances are never raised in spite of foaming. The velocity of the oxygen at the exit of the lance is 1,000 ft./sec. and the heavy foaming condition appears to blanket the splash. It is felt that this is significant and that higher oxygen flows could be used without excessive damage to refractories. Scrap protruding through the bath disappears rapidly after hot metal is added.

End firing is gradually reduced after hot metal to a minimum of 120 gal. of oil per hour. The use of oxygen through end burners is discontinued.

Flushing begins 30 min. after the addition of hot iron and continues to some extent until bath carbon reaches a level below 1 per cent. carbon. End firing is virtually discontinued from start of flushing until shortly before tapping. During this period the furnace is operated with maximum draft-to-control slag temperature.

Throughout the series of experimental heats, fuel usage through end burners was steadily decreased. It became increasingly more apparent in this work that no end firing is required during the refining and finishing stages of the heat.

Frequent carbons and temperature checks are taken throughout the heat. The first carbon and temperature were taken 60 min. after hot metal and were 2.09 per cent. carbon and 1,420 deg. C. This is 1 hr. 43 min. after start to charge. At 79 min. after hot metal was added, the carbon was 1.27 per cent. and the temperature was 1,460 deg. C. At 82 min. after the addition of hot metal 3,000 lb. of iron ore was added.

The carbon dropped to 0.39 per cent. and the temperature increased to 1,530 deg. C. 105 min. after hot metal addition. At 115 min. after the hot metal addition the carbon was 0.28 per cent. and temperature 1,575 deg. C., at this time 1,000 lb. of iron ore was added and preparations for tapping began. Eight minutes later, that is, 123 min. after the hot metal addition, the carbon had dropped to 0.08 per cent. and the temperature was 1,590 deg. C. The heat was tapped 127 min. after hot metal.

The total charge-to-tap time amounted to 2 hr. 50 min. for 198.8 tons, or a rate of 70.2 ton/hr. Total charge-to-tap fuel was 1,368,000 B.t.u./ton, with a total oxygen consumption of 1,575 cu. ft./ton. The final percentage analysis of this heat was C 0.055, Mn 0.29, P 0.007, S 0.020.

Summary of Heat Cycle.

Operation.	Total time.	Total elapsed time.
	Hr. Min.	Hr. Min.
Cold charging	0 23	0 23
Door banking	0 09	0 32
Hot metal addition	0 11	0 43
Hot metal to 1st carbon ..	0 60	1 43
1st carbon to tap	0 67	2 50

Tons tapped, 198.8. Tons/hr. chg. to tap, 70.2. Cu. ft. oxygen/ton, 1,575. Btu/ton $\times 10^6$, 1.368. Heat percentage analysis: C 0.055, Mn 0.29, P 0.007, S 0.020.

English Steel Group at Leipzig Fair

PRODUCTS of the English Steel Corporation, Limited, Sheffield, its subsidiary companies, Taylor Bros. & Company, Limited, Manchester, and the Darlington Forge, Limited, Darlington, and its associated company, Firth-Vickers Stainless Steels, Limited, Sheffield, will be displayed on one large group stand at the Leipzig Spring Fair, which opens on Sunday.

English Steel will be featuring high-grade carbon and alloy steels (which can be manufactured to German, British, and other recognized standards), high-speed steels, carbon and alloy tool steels, precision ground, centreless turned, and bright reeled bars. Other exhibits will include:—Dropforgings for the aircraft, automobile, and general engineering industries; coil and laminated springs for road transport; torsion bars; automatic couplers for mine cars; engineers' cutting tools, and permanent magnets. Scale models of wheels and axles will be shown by Taylor Bros. & Company, and a model "Doxford" marine crankshaft by Darlington Forge.

Firth-Vickers Stainless Steels will be featuring stainless steel sheet and bars, precision, shell moulded, and static castings, and centri-spinnings.

Internal Steel Quality Conference

Orders are now being accepted for copies of the report of the conference on "Internal Steel Quality and Methods of its Assessment," held in May, 1960, under the auspices of the West of Scotland Iron and Steel Institute. Summaries of the papers were given in IRON AND COAL during August and September. The report contains the full text of all the papers and the subsequent discussions and will form Vol. 68 of the Journal of the Institute. Copies, costing 47s. (cloth bound), may be obtained from the institute at 39, Elmbank Crescent, Glasgow.

New Literature

HOUSE magazines, catalogues, booklets, and other literature recently received include those referred to below. Readers wishing to obtain a copy of any of the items listed should apply direct to the address given, at the same time mentioning IRON AND COAL.

ASHMORE, BENSON, PEASE & COMPANY, LIMITED, Stockton-on-Tees—"Stress Relieving" is the title of a pamphlet (SR 261) just issued.

NATIONAL UNION OF MANUFACTURERS, 6, Holborn Viaduct, London, E.C.1—Subjects covered in articles in the February issue of the British Manufacturer (2s.) include "Sickness Insurance for Executives—Non-cancellable" and "Wages During Absence."

MARTONAIR, LIMITED, Parkshot, Richmond (Surrey)—The latest issue (Vol. 4, No. 27) of the Journal of Applied Pneumatics (1s. 6d.) contains articles dealing with compound dispensing, rolling mills, lubricator production, testing artificial limbs, and automatic tyre inflation.

NASH & THOMPSON, LIMITED, Hook Rise South, Tolworth (Surrey)—Based upon the equipment previously supplied to industry against special requirements, the company is now marketing a wide range of creep and rupture testing machines, furnaces, and extensometers. A detailed description of each model is given in leaflet PBX.

TARMAC, LIMITED, Ettingshall, Wolverhampton—Many of the activities of the Tarmac group of companies are featured in a new and very attractive publication. It will interest those who are familiar with the great variety of work carried out by the group, while those without such knowledge will find it a first-class introduction to Tarmac.

ASSOCIATED ELECTRICAL INDUSTRIES, LIMITED, 33, Grosvenor Place, London, S.W.1—Articles in the February number of AEI Engineering include:—"Hydro-electric Machines for Pumped Storage." "A Mass Spectrometer for Breath Analysis." "Self-contained Oil Lubrication Systems for Rolling Element Bearings." "Cadmium Sulphide Crystals for Gamma-ray Detection." "Electronic Control of Machine Tools." and "Out-of-step Protection for Synchronous Motors." The authors are all associated with the AEI group.

ALUMINIUM DEVELOPMENT ASSOCIATION, 33, Grosvenor Street, London, W.1—The Aluminium Courier, published quarterly (2s. 6d.), contains an interesting article on "Aluminium in Structural Engineering." The author points out that the increasing use of aluminium in structural engineering is among the most important developments in this field since the end of the last war. Recent applications have proved convincingly, he says, that aluminium has uses that would not have been considered practicable 25 years ago. "Surface Finishes for Aluminium" is among the other contributions in the December issue, just received.

JOHN LAING & SON, LIMITED, N.W.7—Some of the group's recent activities at home and oversea are described in the latest edition of Laing Year. This is an elaborate and attractive publication. Among the many projects carried out by the Laing organization was a major civil engineering programme for the National Coal Board in connection with Lea Hall Colliery, near Rugeley. The company was responsible for the construction of all the colliery surface buidings and reinforced concrete structures on the 46-acre site on the plain of the river Trent. Details of this work and many other projects are outlined in Laing Year, which is profusely and magnificently illustrated.

POWER-GAS CORPORATION, LIMITED, Stockton-on-Tees—This company, which designs, supplies, and erects plant and equipment for the chemical, petrochemical, petroleum, gas, iron and steel, and nuclear energy industries, also provides a complete construction service to the process industries from flow sheet or from technical designs supplied by client to completion of erection. All aspects of constructional engineering, including civil, mechanical, and structural, are available. An elegant brochure, "Complete Project Engineering and Erection Services," has just been issued to detail the various aspects of the company's activities.

For the Technical Writer

A 16-PAGE booklet, "Notes for Authors," published by the Iron and Steel Institute, is intended to assist contributors to the institute's Journal in the preparation of their copy, but, despite the fact that "house style" varies fairly widely between one publication and another, there is much in it that will prove helpful to all concerned with writing and editing MSS. for the technical Press.

Wisely, the author has included many quite elementary pieces of advice, such as: "Manuscripts should be typed, using double spacing, on one side of the paper only. Good margins should be provided, not less than 1 in. all round." All this sort of thing is worthy of emphasis. Many prospective writers for the technical Press are not journalists, but by giving attention to many of the hints contained in "Notes for Authors" they will enhance their chances of having their work accepted and they will certainly ease the burden of the sub-editors and printers.

The booklet is available from the institute at 4, Grosvenor Gardens, London, S.W.1.

TI Tubes at Leipzig Fair

OVER 2 tons of TI precision seamless and welded tubes, in carbon, stainless, and alloy steel, will be displayed on the Tube Investments' steel tube division stand at the Leipzig Spring Fair. The exhibits have been chosen from a total of more than 3,000 kinds, shapes, and sizes of tubes made by TI's 13 tube manufacturing companies.

One tube weighing over a ton, and of 2 ft. dia., will contain another finer than a human hair. To demonstrate that this is a tube, it will be immersed in water and air blown through it.

A feature will be the wide range of tubes for nuclear engineering and the dairy industry, and the great variety of sizes for other applications.

BECAUSE OF THE General Strike, Belgium's crude steel production in January dropped to only 124,721 tons. December output was 427,000 tons, while the November output was 596,000 tons.

New Patents

PATENTS below are among the complete specifications accepted listed in the Official Journal (Patents). The numbers given are those under which the specifications have been printed and all subseq

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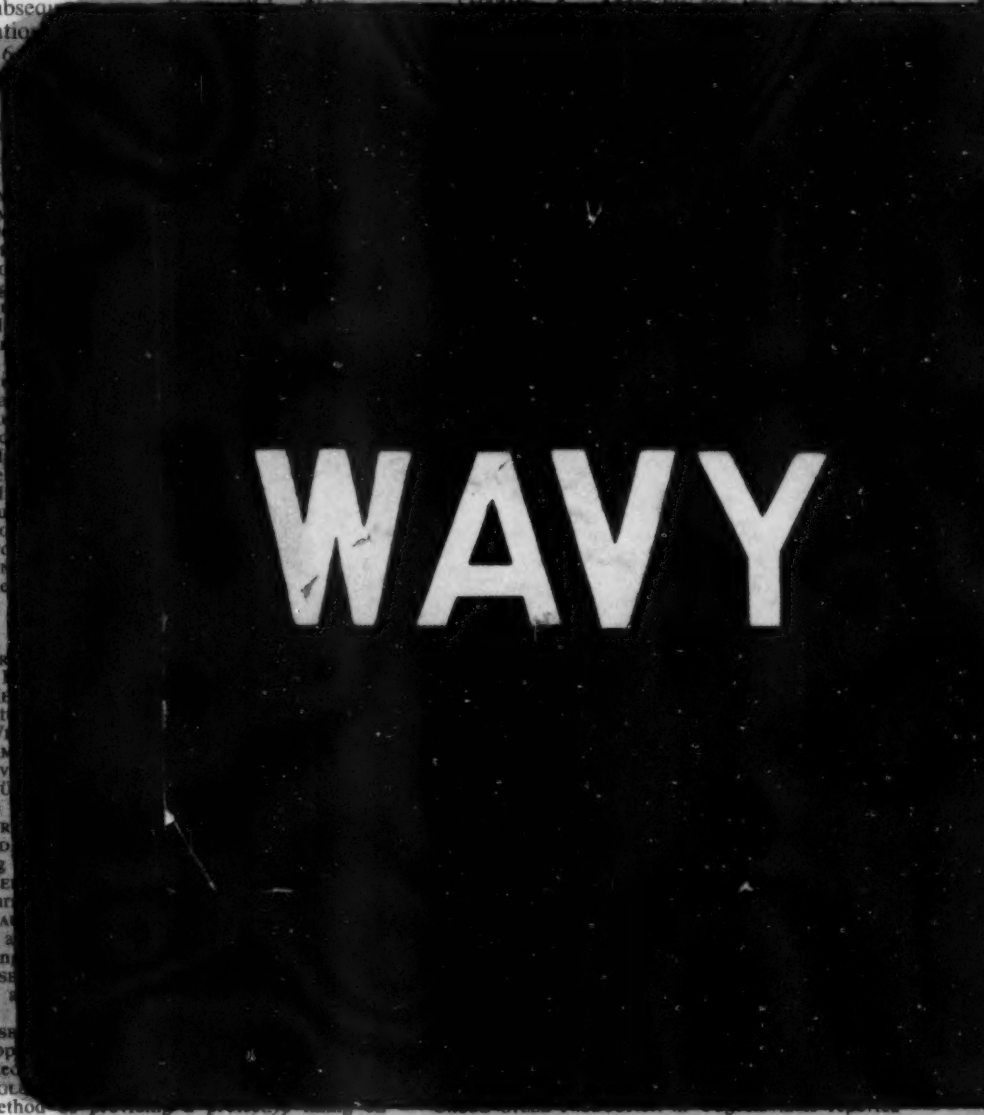
854,492 BAU-STAHLGEWEBE G.m.b.H. Method of producing steel wire for the reinforcement of concrete.
854,729 KLÖCKNER-HÜTTENWERK HASPE A.G. Sintering of fine ores.

855,402 DELTA METAL COMPANY, LIMITED, and MANGAN, C. A. Apparatus for hot coiling metal wire, rod, sections, and the like.
855,105 FURMANEK, B., HALESOVSKY, J., and WITTICH, W. Shoot for mine stowage.
855,150 ENGLISH STEEL CORPORATION, LIMITED. Crank-shaft forging apparatus.
855,092 HOUILLERES DU BASSIN D'AQUITAINE, and



to have increased by 7 per cent. in 1960 to 1,526,000 tons. Production is not sufficient to cover requirements and imports of iron and steel products this year are expected to be about 350,000 tons, mainly flat products.

New Equipment and Products

Coal Handling by Tractor

PAGES

Device to Warn of Machinery Failure

NOW being produced by Hird-Brown, Limited, 244, Marsland Road, Sale (Ches), is a photo-electric device which will give warning of the slowing down or stoppage of machinery used in continuous processes. The device, which can sense changes in rotation and other movement, is particularly useful where machinery is left unattended and can monitor many types of machinery, including conveyors, rotating shafts, fans, rollers, press rolls, reciprocating shafts, levers, and crank arms. The unit is dust-tight for use in industrial conditions.

As there are no "make and break" contacts nor any mechanical connection with the monitored drive, ad is imposed reliable, but should there is operated interruptions ich maintain Should the elow a pre- or stop with oken or un- will give an rection. Mag- hoto-electric, lso ava.lable.

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models distri- George Cohen d, in the past L 12-20 R rail including the s KL12-20 M -20 LO lorry- e latest model operating in les, Limited. h the other 0 R crane has f 20 tons at the standard ting capacity oted for the gned for this -way chassis is

FIG. 2.—NEW JONES RAIL CRANE.

New Patents

PATENTS below are among the complete specifications accepted listed in the Official Journal (Patents). The numbers given are those under which the specifications have been printed and all subsequent proceedings will be taken.

Applications for copies of the full specifications (3s. 6d. each, post free) should be made to the Patent Office, 25 Southampton Buildings, Chancery Lane, London, W.C.2.

Mining and Mining Appliances

854,289 GEWERKSCHAFT EISENHÜTTE WESTFALIA. Belt conveyor.
853,972 SMITH, H. M. N. Miners' safety lamps.
854,050 SMITH, H. M. N. Miners' safety lamps.
854,967 DOBSON, LIMITED, W. E. & F. Mine roof supports.
854,978 EGGEMANN, W., and CAMPENHAUSEN, VON E. (trading as SCHWARZ KOMM.-GES., H.). Supporting elements for mines.
854,687 MASTABAR MINING EQUIPMENT COMPANY, LIMITED, and TEBB, B. Jointing of conveyor, power transmission, and like belts.
854,671 AUSTIN HOY & COMPANY, LIMITED. Coal-cutter and like tool-carrying chains.
854,537 AUSTIN HOY & COMPANY, LIMITED. Coal-cutter chains.
854,721 MINE SAFETY APPLIANCES COMPANY. Protective helmet linings.
855,172 MINING & GENERAL ENGINEERS, LIMITED. Coal-cutting machines.
855,471 CONSOLIDATION COAL COMPANY. Endless belt conveyor.
855,279 UNION CARBIDE CORPORATION. Cutter picks and means for mounting such picks in mineral-mining mechanics.

Metallurgy and Engineering

854,462 BRITISH IRON AND STEEL RESEARCH ASSOCIATION. Electrical control by switching circuits.
854,176 HERAEUS G.m.b.H., W. C. Methods and apparatus for melting ductile metals.
854,440 WILLIAMS, J. H. V., WILLIAMS, W. S., WILLIAMS, J. H., and WILLIAMS, J. X. Method of preventing scale on ingot moulds.
854,010 HÜTTENWERK SALZGITTER A.G. Charging devices for shaft furnaces.
854,023 GROSS MANUFACTURING COMPANY (1938), LIMITED. Wire-coiling and other machines for treating wire and rod between rolling surfaces.
854,232 HERAEUS G.m.b.H., W. C. Vacuum induction furnace and method for its operation.
854,427 DAUSSAN, H. J. Device for forming a screen against the inner face of the upper part of an ingot mould.
854,765 OSBORN MANUFACTURING COMPANY. Method of and apparatus for treating metal strip and the like.
854,766 OSBORN MANUFACTURING COMPANY. Method and apparatus for brushing metal strip or like elongated metal workpieces.
854,607 OGLEBAY NORTON COMPANY. Apparatus for and method of providing a protective lining on a hot top.
854,492 BAU-STAHLGEWEBE G.m.b.H. Method of producing steel wire for the reinforcement of concrete.
854,729 KLÖCKNER-HÜTTENWERK HASPE A.G. Sintering of fine ores.
855,402 DELTA METAL COMPANY, LIMITED, and MANGAN, C. A. Apparatus for hot coiling metal wire, rod, sections, and the like.
855,105 FURMANEK, B., HALESOVSKY, J., and WITTICH, W. Shoot for mine stowage.
855,150 ENGLISH STEEL CORPORATION, LIMITED. Crank-shaft forging apparatus.
855,092 HOUILLERES DU BASSIN D'AQUITAINE, and LECOMTE, A. Apparatus for loading and conveying coal or ores.

Fuel Treatment and Utilization

854,001 WOODALL-DUCKHAM CONSTRUCTION COMPANY, LIMITED. Externally heated retorts or chambers for the carbonization of coal.

Russian Work on the Theory of Creep

RECENT translations available from the Iron and Steel Institute under its translation service scheme include "The Theory of Creep and Long-time Strength of Metals" by I. A. Oding, V. S. Ivanova, V. V. Burdukskii, and V. N. Geminov, of Moscow. The translation (BISI 1644), which may be obtained from the institute at 4, Grosvenor Gardens, London, S.W.1, is in three parts, the cost being £6 10s for each chapter, or £15 for all three. Synopses of the three parts are given below.

PART I: "The Ring Method of Testing Materials in Relaxation."—Methods of stress relaxation testing. The study of relaxation in metals using the ring testpiece. Specimen shape and dimensions. Relationship between initial stress levels and the span of the ring. Strain in the thickened section of the ring. Ring of uniform section. Stress distribution in the ring testpiece during the relaxation process. Comparative study of results of stress relaxation tests on ring and cylindrical testpieces.

PART II: "Stress Relaxation in Metals."—Theories of stress relaxation. Stress relaxation criteria. Diffusion plasticity in the stress relaxation of metals. Temperature dependence of the coefficient of inter-granular strength. The mechanism of diffusion plasticity during relaxation. Influence of various factors on the stress relaxation criteria: influence of prior loading on the relaxation of Armco iron and steel 1 Kh18 N9 T, influence of testpiece shape and absolute size on the relaxation criteria, study of stress relaxation under conditions of varying temperature.

PART III: "Relaxation and Creep."—The connection between creep and stress relaxation phenomena in metals. Relationship between the criteria of creep and stress relaxation. The possibility of damage to metals in stress relaxation.

CRUDE STEEL PRODUCTION in Yugoslavia is reported to have increased by 7 per cent. in 1960 to 1,526,000 tons. Production is not sufficient to cover requirements and imports of iron and steel products this year are expected to be about 350,000 tons, mainly flat products.

New Equipment and Products

Coal Handling by Tractor

SPECIAL-purpose coal-handling dozer blades (Fig. 1) for models 180 and 250 tractor dozers are announced by Michigan (Great Britain), Limited, Camberley (Surrey). Designed to move bulk quantities of coal into stocking-out grounds or reclaiming coal from coal stocks or feed hoppers, the horseshoe-shaped coal blades have a larger radius of curvature than the standard blade, enabling the coal to be rolled more easily.

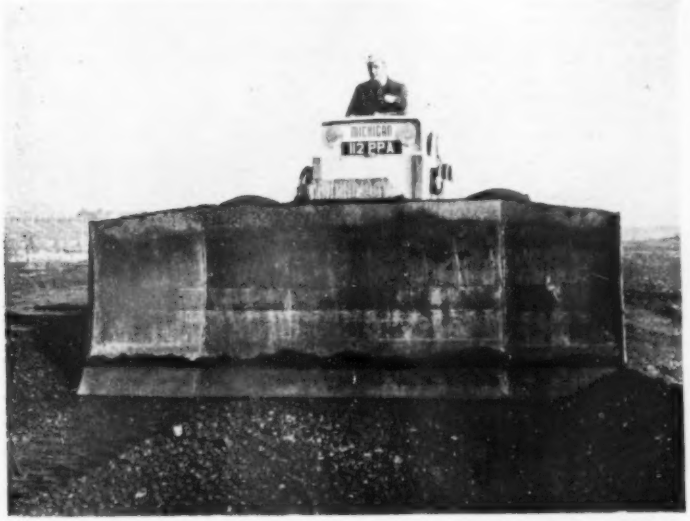


FIG. 1.—MICHIGAN 180 TRACTOR FITTED WITH COAL HANDLING DOZER BLADE.

The power train system, driving all four wheels on wide-base low-pressure tyres, enables several advantages to be obtained in using Michigan tractor dozers with coal-handling blades. These include compaction densities of up to 70 lb./cu. ft. to be obtained, a reduction in the risk of spontaneous combustion, minimizing the amount of moisture seepage, less contamination of the coal by crushing, and a reduction in track costs.

Coal-handling trials, using the Michigan 180 tractor with a special-purpose coal blade 12 ft. by 4 ft. 6 in., have recently been carried out at Brighton "B" generating station. The machine performed satisfactorily and climbed slopes of between 30 and 35 per cent. grades. The hydraulic tilt cylinder, which enables either end of the blade to be tilted through a vertical movement of 18 in., proved to be a valuable asset on stockpiles and uneven ground.

Device to Warn of Machinery Failure

NOW being produced by Hird-Brown, Limited, 244, Marsland Road, Sale (Ches), is a photo-electric device which will give warning of the slowing down or stoppage of machinery used in continuous processes. The device, which can sense changes in rotation and other movement, is particularly useful where machinery is left unattended and can monitor many types of machinery, including conveyors, rotating shafts, fans, rollers, press rolls, reciprocating shafts, levers, and crank arms. The unit is dust-tight for use in industrial conditions.

As there are no "make and break" contacts nor any mechanical connection with the monitored drive, installation is extremely simple and no load is imposed on the drive. The unit is intrinsically reliable, but it has been designed to give an alarm should there be any component failure. The device is operated by repeated regular interruptions of a light beam which maintain energy to a relay. Should the interruptions fall below a predetermined speed or stop with the light beam broken or unbroken the relay will give an alarm or initiate correction. Magnetic, as well as photo-electric, sensing heads are also available.

New Jones Rail Crane

LATEST of three models distributed by the George Cohen 600 Group, Limited, in the past 18 months is the KL 12-20 R rail crane, the other two including the 20-ton capacity Jones KL12-20 M mobile and KL 12-20 LO lorry-mounted cranes. The latest model is shown in Fig. 2 operating in the works of Colvilles, Limited.

In common with the other models, the KL 12-20 R crane has a lifting capacity of 20 tons at 10-ft. radius, using the standard 30-ft. jib. A shunting capacity of 150 tons is quoted for the normal chassis designed for this duty. A permanent-way chassis is

FIG. 2.—NEW JONES RAIL CRANE.

available, allowing the crane to travel in train. The standard power unit is a Perkins "Four 270D" diesel engine and transmission to the various crane motions is of the direct mechanical type, pneumatically operated controls ensuring finger-tip precision in handling all loads.

The machine at Colvilles has been equipped with a 54-in. dia. electro magnet, which enables it to handle scrap, pig-iron, and other ferrous materials. In this instance, a separate generator for the magnet is mounted on the left-hand side of the slewing superstructure, but a smaller capacity magnet equipment, using a generator powered by the crane's own engine, can be supplied. Disconnection of the magnet to allow the crane to be used for general lifting duties is quick and simple. This new Jones KL 12-20 R model is built at Letchworth by K & L Steelfounders & Engineers, Limited, whose associates in the 600 Group, George Cohen Sons & Company, Limited, act as sole UK distributors of the complete range of Jones cranes.

Mark IV Chain-grate Stoker

INTRODUCTION of the Mark IV chain-grate stoker has been announced jointly by James Hodgkinson (Salford), Limited, Ford Lane Works, Pendleton, Salford 6 (Lancs), and Bennis Combustion, Limited, Little Hulton, Walkden, Manchester. This stoker is the result of the accumulated experience of both companies over a number of years.

The grate has been completely redesigned, there being now three patterns of links giving full self-cleaning action and clearer air spaces for improved cooling and more effective distribution of primary air, resulting in better combustion and higher output. Link rods are shouldered for positive tightening without restricting link movement and there is full diameter penetration of the side links. A positive and almost frictionless drive is obtained with redesigned front sprockets bearing on all driving links through rollers incorporated in the grate. A new rear drum supports the full width of the grate.

As with previous models, automatic combustion control equipment is available for the Mark IV chain-grate stoker, and now special internal baffles, based on the latest research data, are also available.

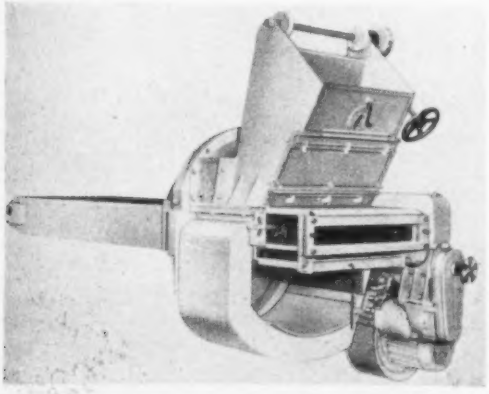


FIG. 3.—MARK IV CHAIN-GRATE STOKER.

Salta Cutter

INTRODUCED into the United Kingdom by Rolled Steel Products (London), Limited, 197, Knightsbridge, London, S.W.7, a cutting tool of Swiss design is of particular interest for its versatility and complete portability. Weighing only about 30 lb., it is eminently suitable as an on-site or maintenance tool and has obvious applications in the iron and steel, coal, and general engineering industries, among many others.

By means of various abrasive-coated discs, it can

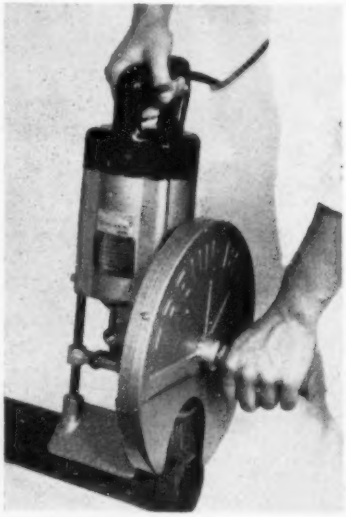


FIG. 4.—THE SALTA CUTTER IN OPERATION.

cut items in iron and steel, such as angles, pipes, solid rod, corrugated sheet, etc., and similar items in alloy and soft materials. It will also cut stone and ceramic products and wood and hard plastics. Colliery engineers will be especially interested in the facility with which it cuts wire ropes—anything up to 3 in. dia., although on locked coil high-tensile rope the safe limit is 2 in. dia. It can tackle pipe at right angles up to any diameter, and various attachments permit mitre cutting up to 45 deg. either way, but only on pipes up to 5 in. dia. The governing dimension on pipe, tube, and angle is a wall thickness up to $\frac{1}{4}$ in.

Maximum safety is ensured by the flexible discs, which are unbreakable, and by the fact that only one eighth of the disc is exposed during cutting. Power is from a 1.5-h.p. universal motor and models are available for operation on 220/240, 110, and 50 volts. Motor speed is 12,000 r.p.m., but the spindle free-running speed is geared down to 5,000 r.p.m.

New Vibratory Screens

FOR many years the Sinex Engineering Company, Limited, North Feltham Trading Estate, Feltham (Middx), has marketed a range of totally enclosed single- and double-deck screens particularly suitable for fine powders, slurries, and foodstuffs. More recently additions have been made to the range of products manufactured utilizing the company's rotary electric vibrator as a power unit—power station coal reclama-

tion hopper grids and vibratory chutes, grizzlies, and bunker clearance equipment.

A need has now been fulfilled for a rugged, simple, cheap screen for use in quarries, mines, and other bulk material handling plants. The new range is manufactured in standard sizes 4 ft. by 3 ft., 6 ft. by 3 ft., 8 ft. by 4 ft., and 10 ft. by 4 ft. The screening desks can be fitted with meshes profiled or fabricated and are powered by the latest type Sinex rotary electric vibratory in which all moving parts are totally enclosed within casings. These vibrators are fitted with adjustable amplitude weights and of a design life tested for 5,000 hr. between maintenance inspections.

The screens are designed for use with vibratory chutes and can be interlocked with bunker vibrators to serve as vibratory feeders from bulk storage hoppers.

Sealing Tape for Pipe Joints

CLEANER and easier to apply than conventional sealing compounds, "Hilflon," unsintered P.T.F.E. tape is the latest development of the P.T.F.E. division of William Rose, Limited, Lockfield Avenue, Brimsdown (Middx). Manufactured from the inert non-toxic thermo plastic polytetrafluoroethylene, it possesses thermal stability with a resistance to most known chemicals, acids, alkalis, oils, corrosive liquors, and gases.

Available in a compact roll, it is economically dispensed and transported, thus removing the need for storing bulky containers and drums in which the more conventional sealing compounds, such as white lead, hemp, and graphite, must be kept.

"Hilflon" is manufactured from unsintered P.T.F.E. and is available in a standard size roll, ½ in. wide and approximately 43 ft. in length. Variations in width and thickness can be provided for sufficiently large quantities, though the standard pack has a tape thickness of 0.003 in. nominal.

The tape is a compressible solid and it easily moulds itself to all threaded materials (Fig. 5). Having a coefficient of friction lower than graphite and molybdenum disulphide gives it an anti-seizing property so that joints can be easily broken after very long periods.

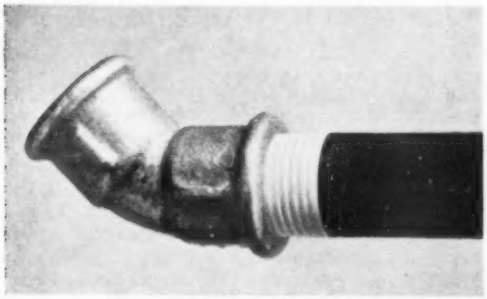


FIG. 5.—PIPE JOINT SEALING WITH "HILFLON" P.T.F.E. TAPE.

Electro-magnetic Welding Clamp

A NEW Melbro electro-magnetic welding trolley, shown in Fig. 6 is claimed to have reduced labour costs by up to 40 per cent. in clamping of joists, shipyard stringers, and girder sections, and the aligning of plate sections during welding. Some leading shipbuilders and constructional engineers have now dispensed with the more costly and less efficient system of welding temporary bridging connections to facilitate fabrication. Apart from the obvious saving in preparatory work, no time is now wasted on the grinding off of old welds left by the removal of a temporary bridge. The

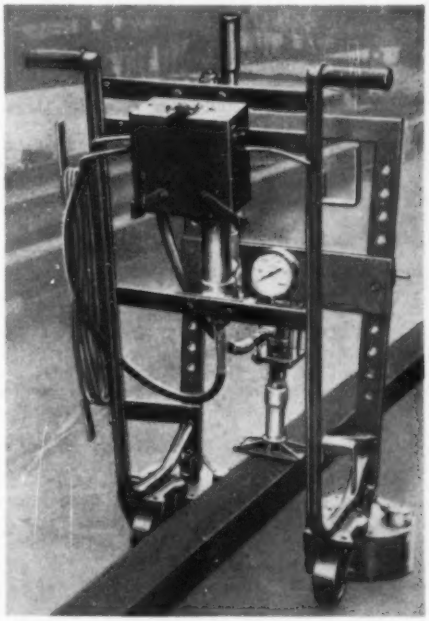


FIG. 6.—MELBRO ELECTRO-MAGNETIC WELDING TROLLEY.

entire clamping operation can be carried out by only one man where two or three were previously required.

Developed by Melbro Machine Tools, Limited, 2a, Alexandra Road, Manchester 15, the welding trolley incorporates two powerful M4 magnets and a hydraulic ram. It can exert pressures of up to 5 tons and is fitted with an adjustable bridge piece to accommodate stringers and joists of all sizes up to 19½ in. height.

A special feature of the device is that the pressure gauge is calibrated to show the cohesion rating for various thicknesses of plates. The cohesive force exerted by the magnets is claimed to be much greater than that of any known type of vacuum clamp. Mounted on rubber-tyred wheels for easy handling, the Melbro welding trolley can be supplied for all voltages from 24 upwards.

C.P. "Magnamatic" Screwdriver

TO meet the demand for a tool which will eliminate damage such as stripped threads and distorted workpieces due to application of excessive torque during tightening of screws and nuts, a new torque controlled screwdriver and nutrunner incorporating a "magnamatic" clutch and known as the CP 3008—LMS—1600, has been introduced by the Consolidated Pneumatic Tool Company, Limited, 232, Dawes Road, London, S.W.6.

The new tool uses a magnetic clutch formed by a magnet housed inside a pair of mating, cylindrical jaws. At one end, the jaw cylinder is tapped to accommodate the threaded shank of the cylindrical

magnet which fits inside the jaws, while a steel disc is located at the other end of the cylinder. The jaw teeth are curved, the depth to which these interlock being governed by the number of turns made in the magnet shank. In operation, the torque required to separate the two jaws depends upon the depth of engagement. When the required torque is reached, the jaws disengage, the lower jaw being held out of engagement by a latch released when the tool is withdrawn from the work.

The "magnamatic" screwdriver is equipped with a lever handle and has a nominal capacity screw size range from No. 4 to No. 8. The range of torque adjustment is from 5 to 20 in.-lb. on soft pull-up work, while on free running, sudden-stop work the maximum torque value is 40 in.-lb. The overall length of the tool is 10 in. and the net weight is 1 lb. 14 oz., the air inlet thread size being $\frac{1}{4}$ in.

Automatic Hydraulic Clamping

AUTOMATIC hydraulic clamping in the shape of a compact and inexpensive handful of power called the Newton swing clamp (Fig. 7) is the latest addition to the system of hydraulic clamping manufactured by Power Jacks, Limited, Agnes Road, Acton, London, W.3. Clamping jobs taking several minutes by older methods are, it is claimed, done in a flash by the new "flick-on," "flick-off" swing clamp.

As its name implies, the Newton swing clamp has a swinging arm action. It is small, powerful, and fast, and may be used singly or in series. In the "off" position, the clamping arm is lying at right angles to the work, giving ample room for positioning and unloading. At the touch of a lever, the arm swings in over the work and is tilted by a hydraulic plunger to apply pressure. The combined movement is completely automatic. When released the arm swings back to the start position.

Installation is simple, and the small size of the clamp (7 in. by $3\frac{1}{2}$ in. with a maximum clamping force of 1,160 lb.) is a great advantage where space is limited. No maintenance is required and the application to clamping problems is universal.

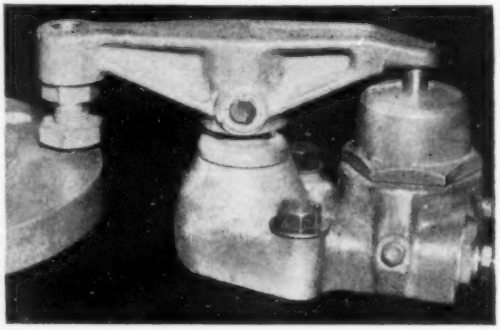


FIG. 7.—THE NEWTON SWING CLAMP IN OPERATION, CLAMPED WORK (LEFT) READY FOR DRILLING.

Coal Production in India

COAL production at the collieries of the National Coal Development Corporation of India attained a rate of 12,500,000 tons per annum during January. By the end of March the production rate is expected to reach its target of 13,500,000 tons a year. Production is to be stepped up to 60,000,000 tons per year by the end of the Second Five-Year Plan period, from 38,000,000 tons, which was the output at the beginning of the Second Plan. Of this the private sector is to contribute 44,000,000 tons per annum, the balance of 16,000,000 tons coming from the public sector, including the Singareni collieries.

The State-owned colliery of Andhra Pradesh is to increase its annual production to 2,600,000 tons from 1,500,000 tons, according to a spokesman of the National Coal Development Corporation. He said that there were, however, certain circumstances beyond the control of the corporation. The quality of coal in one or two projects proved to be inferior. Consequently, even though the estimated production from these projects had been taken into consideration in fixing the target, these projects were not worked.

With 13,500,000 tons per annum as the target before it, the corporation decided to raise 10,000,000 tons by developing new collieries. The rest was to be made by production in the old collieries, whose output was to be stepped up by 500,000 tons. These old collieries reached a production of 3,460,000 tons per annum in 1958-59, thus surpassing their additional production target of 500,000 tons full two years ahead of schedule. Because of their contiguity with new collieries, the spokesman said, for reasons of operational economy two old collieries—Bhurkunda in Bihar and Kurasiya in Madhya Pradesh—were tacked on to Bhurkunda and Kurasiya.

During the four years since the corporation came into existence 10 new collieries, besides Bhurkunda and Kurasiya, were opened in Bihar and Madhya Pradesh. Eleven collieries of the corporation surpassed their target; of these, five exceeded the rate of 1,000,000 tons per annum.

Underground Storage of Natural Gas

Information Circular IC 121, available from the Mines Branch Publication Distribution Office, Department of Mines and Technical Surveys, Ottawa, Canada (price 25 cents), is by R. P. Charbonnier, of the Fuels and Mining Practice Division, and is entitled "Present Status of Underground Storage of Natural Gas in Southern Ontario and Quebec." Various aspects of underground storage of natural gas are considered, including an example of evaluation of market requirements in southern Ontario, a survey of the design and operation of partly depleted fields and aquifer reservoirs, and some cost data. The present facilities and future possibilities of gas storage in southern Ontario and Quebec are also studied, and show the desirability of further investigations of the storage gas pool possibilities in that area.

WORLD SHIPBUILDING IN 1960

Extracts From Lloyd's Annual Summary

ACCORDING to Lloyd's Annual Summary of merchant ships launched in the world during 1960, including vessels of 100 tons gross and upwards, excepting China, East Germany, and Russia (USSR) from whom no returns are available, the total was 8,356,444 tons, a decrease of 389,260 tons compared with 1959.

Great Britain and Northern Ireland

During the year 1960 there were launched in Great Britain and Northern Ireland 253 merchant ships of 1,331,491 tons (33 steamships of 574,507 tons and 220 motorships of 756,984 tons). This total is 41,104 tons less than in 1959, but a comparatively steady output enabled Great Britain and Northern Ireland to maintain second place among the shipbuilding countries of the world. The general world trend is downward, but a few countries have still risen to individual records.

Principal districts show considerable fluctuation in output as compared with 1959:—Clyde, 416,981 (+33,964) tons; Tyne, 262,085 (+4,211) tons; Wear, 208,433 (−39,094) tons; Belfast, 184,638 (+64,217) tons; Tees, 144,462 (+31,282) tons; Mersey, 27,590 (−61,408) tons; Forth, 24,468 (+3,230) tons; Humber, 17,813 (+2,514) tons; Tay, 15,895 (−12,381) tons; Barrow, nil (−41,000) tons.

Ships intended for the carriage of oil in bulk totalled 46 of 618,372 tons (18 steamships of 434,588 tons and 28 motorships of 183,784 tons), an increase of 89,444 tons as compared with 1959. This tonnage represents 46 per cent. of the total output in 1960, compared with 38.5 and 41.2 per cent. in 1959 and 1958, respectively. Among the six steamships and 29 motorships between 10,000 and 15,000 tons, there are 16 oil tankers and 13 ore carriers.

Abroad

There were launched abroad during the year 1,767 ships of 7,024,953 tons (154 steamships of 2,828,192 tons and 1,613 motorships of 4,196,761 tons); a decrease of 348,156 tons as compared with 1959. As was then the case, no returns are available for certain countries. Decreases in tonnage launched are considerable for Sweden, the United States, West Germany, Norway, and Italy. Japan, Denmark, and Yugoslavia have approximately maintained their output of 1959. Against the general trend, France, Spain, and Poland increased their output to individual records, while Canada is at her highest level since 1945.

Fluctuations in tonnage launched by certain leading countries abroad in 1960 compared with 1959 were as follow:—Japan, 1,731,656 (+9,079) tons; Germany (West), 1,092,139 (−109,999) tons; Sweden, 710,659 (−145,983) tons; France, 594,422 tons; USA, 484,978 (−111,779) tons; Italy, 433,840 (−84,489) tons; Poland, 227,221 (+43,556) tons; Denmark, 219,323 (−5,219) tons; Norway, 197,933 (−109,534) tons; Spain, 161,289 (+48,869) tons; Canada, 115,919 (+28,377) tons.

The largest ships launched abroad included:—s.s. Universe Daphne, 72,266 tons (Japan); s.s. France, 66,000 tons (France); s.s. Naess Sovereign, 54,736 tons (Japan); s.s. Sitala, 49,363 tons (France); s.s. Naess Pride, 42,146 tons (W. Germany); s.s. Naess Spirit, 41,327 tons (W. Germany); s.s. J. Paul Getty, 40,906 tons (France); s.s. Burl S. Watson, 37,190 tons (Sweden); s.s. Antonietta Fassio, 35,850 tons (Italy); s.s. Ercole, 35,850 tons (Italy); s.s. Farah Pahlavi, 33,630 tons (France); Reza Pahlavi, 33,630 tons (France); s.s. Bearn, 32,749 tons (France); m.s. Atalante, 32,000 tons (Sweden); s.s. Esso Stockholm, 32,000 tons (Sweden). With the exception of s.s. France all these vessels are oil tankers.

From 30,000 up to 32,000 tons there were 15 steamships and two motorships. One of these was an ore and oil carrier, and the remainder were all oil tankers. Next in size came 22 steamships and four motorships between 25,000 and 30,000 tons. All are oil tankers except that one carries ore and oil. Between 20,000 and 25,000 tons there were 23 steamships and 16 motorships. These comprised 32 oil tankers, one ore/oil carrier, five ore and bulk carriers, and one passenger liner.

Ships intended solely for the carriage of oil in bulk totalled 289 of 3,030,428 tons (75 steamships of 2,133,547 tons and 214 motorships of 896,881 tons); a decrease of 815,897 tons as compared with 1959. The output for 1960 included 593,161 tons launched in Japan, 435,768 tons in Sweden, 401,470 tons in West Germany, 347,269 tons in France, 303,211 tons in Italy, 270,994 tons in the United States, 240,411 tons in the Netherlands, and 122,515 tons in Denmark. Oil tankers represent 43.1 per cent. of all tonnage launched abroad, as compared with 52.2 in 1959.

World Output

Regarding world output, as already stated the total launched during 1960, with the exception of those countries before mentioned, was 8,356,444

tons, a decrease of 389,260 tons as compared with 1959. The figures show that as regards methods of propulsion, motorships comprise 59 per cent. of world output, as compared with 58 per cent. in 1959. Steamships include 15 of 77,711 tons with a combination of reciprocating and turbine engines. Geared turbines are to be fitted in 146 ships of 3,303,852 tons. Electric drive will be employed in 29 motorships of 46,698 tons and two turbine steamships of 62,864 tons. In four motorships of 10,931 tons, free piston generators will combine with an exhaust gas turbine.

Oil tankers launched in the world during 1960 amount to 335 ships of 3,648,800 tons, a decrease of 726,453 tons as compared with 1959. Of the total, 17 per cent. was built in Great Britain and Northern Ireland, 16 per cent. in Japan, 12 per cent. in Sweden, and 11 per cent. in West Germany. Oil tankers represent 44 per cent. of the world output for 1960, as compared with 50 per cent. in 1959.

Of the steamships and motorships launched in the world during 1960, 624 of 3,880,130 tons (46.4 per cent.) are to be classed with Lloyd's Register. Of this total 240 ships of 1,298,892 tons (97.6 per cent. of the tonnage launched there) were built in Great Britain and Northern Ireland.

Large Orders for GEC in 1960

REVIEWING some of the orders received during 1960 for heavy electrical engineering equipment, the General Electric Company, Limited, states that early in the year Colvilles, Limited, placed an order for power plant to be installed in connection with its Ravenscraig Works. Contracts placed with the heavy electrical engineering section also included an order for rolling mill drives for the Spencer Works of Richard Thomas & Baldwins, Limited. The 63-in. hot-strip mill, for which GEC will supply the main drives, will be one of the most powerful of its kind in the world. Five 8,000-h.p. motors and a 7,000-h.p. motor will drive the 6-stand mill.

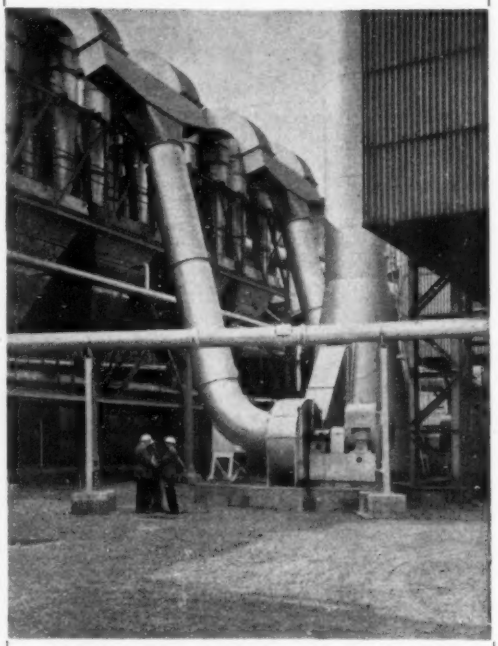
Two oversea orders received by the company are worth together £2,000,000. The first was for two 60-mW. turbo-generators for Kelvin "B" power station, Johannesburg. These were the third and fourth sets for the station, a contract for the first two machines having been received earlier. The second large order was for two 15-mW pass-out turbo-generators for installation in the Ras Abu Aboud power station, Qatar, a state bordering the Persian Gulf.

Morgan Crucible at Moscow Fair

REPRESENTING the Morgan Crucible Company, Limited, group at the British Trade Fair to be held in Moscow from May 19 to June 14 will be a new subsidiary, Morganite Exports, Limited. A wide range of the group's products will be on view.

The three main exhibits displayed will be "Purox" refractories, "Crusilite" heating elements, and "Morganite" and "Morganohm" resistors.

Electric Motors at New Sinter Plant



In the new sinter plant at the works of John Lysaght's Scunthorpe Works, Limited, all the electric motors, ranging from 15 h.p. to 2,750 h.p., were supplied by the English Electric Company, Limited.

The photograph shows three motors, each of 100 h.p., driving dust-collector fans. The two motors for driving the sinter fans are each rated at 2,750 h.p.

FRACTURE OF METALS

INTENDED to give an overall picture of recent work in the field, a vacation course, of three and a half days' duration, on "The Fracture of Metals," is to be held at Battersea College of Technology from April 11 to 14.

The topics to be covered will include:—The practical problems of fracture in service; mechanical testing methods for the assessment of fracture behaviour; theoretical aspects of fracture; the ductile to brittle transition in ferrous and non-ferrous metals; the effect of irradiation on fracture behaviour; temper brittleness in steels; hydrogen embrittlement of metals; fracture under creep conditions, and fracture under fatigue conditions.

The fee (£10 10s.) is inclusive of luncheon and morning and afternoon refreshment. Enrolment forms may be obtained from the Secretary (Metallurgy Courses), Battersea College of Technology, London, S.W.11.

Demonstrating a Conveyor System at Moscow Fair

MAIN exhibit of the material handling division of Fisher & Ludlow, Limited, Tipton (Staffs), at the British Trade Fair in Moscow will be the Flowmaster conveyor system. Visitors will be invited to decide the sequence in which articles are to be fed from the storage conveyor lines onto a feeder or main conveyor. They will operate a teleprinter which will automatically translate their requirements into punched tape.

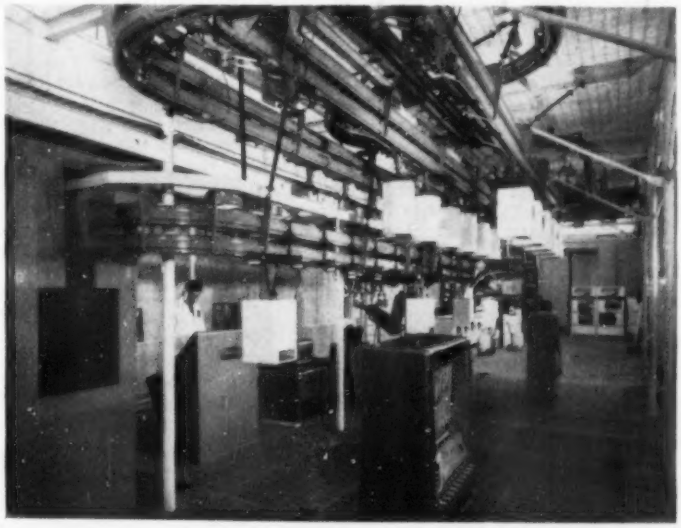
The punched tape is then fed into an electronic "reader" which converts it into electrical impulses. The control unit interprets the instruction from the "reader," operates the conveyor mechanism, and checks that the instruction has been carried out before accepting the next instruction. The visitor will then see the instructions being carried out.

The tape-controlled Flowmaster system is not an experimental exhibit. Its practical applications have already been foreseen and substantial contracts have been undertaken in a variety of industries both in Britain and oversea.

In any production system certain basic decisions have to be made before component parts can start to flow to the assembly lines. The agreed production programme will usually take the form of a hand-written document enumerating quantities and types of goods to be produced. When operating the Flowmaster conveyor system this written document of the programme would be coded so that the teleprinter operator presses the appropriate keys to record the required programme onto the punched tape, which will then control the production sequences.

As a simple illustration of this system, the demonstration conveyors shown in Moscow will incorporate three storage lines, each holding symbolic components in stock. The punched tape is fed into the "reading" machine and the emerging electrical impulses are translated by the control mechanism into movements of the index mechanism of the storage conveyors, so allowing the appropriate components to move from the storage conveyors to the main conveyors. The main conveyor transports the components to their destinations, these being automatically determined through pre-selectors built into the Flowmaster system.

Safeguards are incorporated so that, should a component called for by the tape not be available in the storage conveyor, the tape will remain stationary to hold the programme until the required component becomes available. This ensures that only if each sequence and operation has been correctly performed can the next step or sequence be initiated.



THE PHOTOGRAPH SHOWS THE FLOWMASTER CONVEYOR WITH SIMULATED AUTOMATIC SPRAY BOOTH IN THE FOREGROUND.

NCB TRAINING BOOKLETS

TWO of the training booklets published by the industrial relations department of the National Coal Board have been revised. For use in the training of new recruits at the board's preliminary mining training centres, the booklets concerned are "Pit Ventilation" and "Mine Gases."

"Pit Ventilation" has been entirely recast and expanded so as to deal more fully with that complex subject, while "Mine Gases" has been revised in one or two particular instances in order to comply with changes in Regulations made under the Mines and Quarries Act, 1954, and to bring it up to date.

Water Supply for NCB Drilling Tower

FOR two and a half years a crew of 16 men has lived and worked aboard a 230-ft.-high offshore drilling tower of the National Coal Board, probing the rich coal seams beneath the sea off the Durham coast. The drilling crew spends maximum periods of three weeks on the tower, which is fully equipped with dining room, private quarters, bathrooms, rest-lounge, television, radio, power supply, and radio-telephone for shore communication, as well as workshops and stores for drilling apparatus and sample cores.

Though tenders carrying the tower's food and other supplies occasionally bring stocks of fresh water, the crew's water supply is normally drawn from the sea, and water for drinking, washing, cooking, and engine-cooling is distilled and purified on the tower.

Distillation Plant

The tower's distillation plant will convert 100 gal. of sea water into 80 of fresh water in an hour, and this is adequate for all normal fresh water requirements aboard. The plant, supplied by Buckley & Taylor, Limited, Oldham (Lancs), comprises an evaporator equipped with immersion heaters, a compressor, a steam chest, a heat-exchanger, centrifugal pumps, and electric motors. Incoming sea water is pre-heated in the heat-exchanger (which cools the distillate), then enters the evaporator at a temperature near to boiling point. Steam and water rise in the evaporator tubes and an arrangement of baffles removes the water particles, allowing the steam to pass into the suction pipe of the compressor. Any excess feed-water spills into an overflow pipe, to be carried away to waste.

During compression the temperature is raised and the steam is returned to the chest, from which the distillate flows under gravity to a pump which lifts it to the fresh water storage tanks. The remaining concentrated brine is discharged from the plant during the frothing action of the boiling feed. A fine-mesh strainer incorporated in the suction feed pipe can be cleaned without disturbing the flow. To conserve heat the items of equipment which operate at above the ambient temperature are insulated and covered with aluminium alloy sheeting.

Hot water for baths, showers, washbasins, and the galley is obtained from five 12-gal. tanks fitted with Creda thermostatically controlled immersion heaters, and these tanks obtain their water supply directly from the fresh-water storage.

The Durham drill-rig is the second and larger of two constructed by the NCB. When designing the first, which operated off the Scottish coast from 1955 to 1960 and is now closed down, engineers realized that the ideal pumps for coping with the suction head—60 to 80 ft. from sea level to the working deck—would be submersible electric centrifugal units of the Flygt range. But only d.c. power was available, and the encapsulated motor of a Flygt pump is an a.c. one. Conventional centrifugal pumps, designed for working at a normal head of 25 ft., would have produced maintenance difficulties, as would the use of compressed air, and it was decided to fit the Scottish tower with hydro-ejector pumps.

However, after two years of operating the Scottish rig in the Firth of Forth, when the Durham tower was planned it was decided, in the interests of simplicity and efficiency, to install motor generators converting to a.c. current, so that a Flygt submersible pump could be used. This was embodied in the specification, and the water supply on the Durham tower is delivered by a Flygt B80L fully submersible electric pump, a 3-in.-discharge 5-h.p. unit, capable of delivering 250 gal./min. against a 100-ft. head. Though this type of pump can be—and usually is—simply dropped into water and left to work, in this case the B80L was fixed to the tower structure well below sea level.

The water obtained from the distillation plant is quite tasteless, and must be aerated to make it palatable for drinking. The equipment for this consists simply of a vessel inserted in the gravity feed pipe from the main storage tank and divided by a weir into two compartments, one of which contains "Norbit" carbon. Water enters at the bottom of this compartment, passes up through the carbon and flows over the weir into the other compartment, from which the draw-off connection to the galley is taken.

TESTING FOR INTRINSIC SAFETY

OFFICIAL testing of apparatus in respect of intrinsic safety is to be governed by a new memorandum (testing memorandum No. 10) published for the Ministry of Power by HMSO, price 1s.

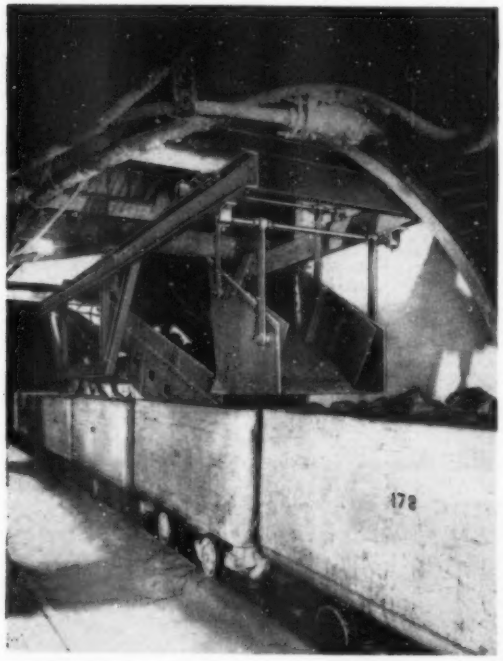
When the first edition was issued in 1946, information about the principle of intrinsic safety and the scope for its application was not readily obtainable. A large part of the old memorandum was therefore devoted to explanation and illustration by examples of particular apparatus to which the principle had been applied.

Since 1946, it has been possible to extend the scope of official certificates of intrinsic safety and apparatus is now accepted for test with respect to many inflammable gases.

A certificate of intrinsic safety relates only to the electrical characteristics of the apparatus or circuit in respect of which the test has been carried out. It does not imply that the testing authority vouches for the article certified in any other respect; nor does it indicate necessarily that the apparatus may be used in particular industries or circumstances, because usage may be subject to other requirements, *e.g.*, the statutory requirements of the Mines and Quarries Act, 1954, or Factories Act, or Regulations made thereunder.

AUTOMATIC MINE-CAR BOOM LOADER

TO overcome breakage at mine-car loading points underground, Goodall Clayton, Limited, Leeds, has produced a small boom loader for a loading point in Sharlston Colliery in No. 7 Area of the North-Eastern Division of the National Coal Board. This equipment reduces breakage to an absolute minimum while increasing the speed of loading. The equipment is basically a flat belt conveyor operated by a motorized tail drum and mounted



THE GOODALL CLAYTON AUTOMATIC MINE-CAR BOOM LOADER.

on a pivot shaft supported on steelwork suspended from transverse girders across the roadway. The raising and lowering of the boom is effected by a compressed-air cylinder operated automatically at predetermined points governed by the mine-car tripping cam valves. A hinged changeover and topping chute at the front of the boom ensures continuous feeding of the conveyor system.

The basic theory of the scheme is to deposit a thick bed of coal at a slow speed with the minimum free drop into the bottom of the car and progressively to raise the boom to build the coal up in the car until it can be finally loaded over the hinged chute. The machine has justified this theory in practice and much reduced the excessive breakage which normally takes place with a gate and loader chute.

Overriding manual control of the loader is available for the first and last cars of a train, but normally the operator has only to govern the speed of the spotting creeper while the boom works automatically. The machine installed is working on 2-ton capacity cars with a maximum design capacity of 280 ton/hr., but larger versions are designed to fill cars of 3-ton capacity and upwards to rates up to 450 ton/hr. The pneumatic features can be replaced by hydraulic or electric operation if required. The machine is of robust construction and is amply rated to give continuous trouble-free service.

The boom loader was designed by Mr. A. S. Rowell, the manufacturer's engineering manager, in close co-operation with Mr. S. Collier, mechanical engineer, No. 7 Area.

Sheet-metal Stoppings in US Mines

DESIGNED for repeated use in advanced headings or in panel entries, sheet-metal stoppings have recently been introduced at several coal mines in south-western Pennsylvania. The stoppings, according to a report in the December, 1960, issue of Mechanization, are constructed of rectangular sheet-metal sections, 12 in. wide, each with 48- and 72-in. long telescopic sections. The sections are extended vertically to a maximum of 10 ft. to fit the height of the roadway with as many sections as necessary to span the width. End sections, specifically designed, are used to fit the rounded sides of roads driven by continuous miners.

Each section is supported in its maximum extended position by clamps which grip the telescopic parts. The clamps are also attached to 1¼-in. angle braces, each 10 ft. long, which serve to brace the sections horizontally. Brattice cloth is used to prevent the escape of air around the edges of the stopping.

In addition to sealing the edges of the stopping it is necessary to seal the joints between the sections. After the unsuccessful use of sealing tape, polyethylene sheet has been satisfactorily used over the entire surface of the stopping. The lightweight sheet, cut to provide a 12-in. overlap on all sides, is fastened to the roof and then allowed to drape against the stopping against the force of air pressure.

AIMED AT the small-to-medium size manufacturer, the object of a one-day conference of the Society of Instrument Technology and the Birmingham Productivity Association is to show the various aspects of instrumentation which will increase productivity profitably. The conference will be held at the Birmingham College of Technology, Gosta Green, Birmingham, on March 29.

Forthcoming Events

MARCH 6

Institute of British Foundrymen (Sheffield Branch):—Meeting at the Technical College, Pond Street, Sheffield, at 7 p.m. "Running, Gating, and Feeding of Blackheart Malleable," by W. J. Campbell.

Institution of Plant Engineers (Sheffield and District Branch):—Meeting at the Station Hotel, Chesterfield, at 7.30 p.m. "Industrial Diseases and Factory Hygiene," by Dr. Hartley (Samuel Fox & Company, Limited).

Institute of Marine Engineers (Merseyside and North Western Section):—Meeting at the Liverpool Engineering Society, The Temple, Dale Street, Liverpool, at 6 p.m. "General Developments in Ceramics for Marine Engineering," by F. J. Aldred and N. W. Hinchliffe.

MARCH 7

Institution of Chemical Engineers:—Meeting at the Geological Society, Burlington House, London, W.1, at 4 p.m. Papers on "Fluidization" from A.E.R.E., Harwell.

Midland Counties Institution of Engineers:—Invitation to members to attend a meeting of the Midland Counties Branch of the Institution of Structural Engineers at the East Midlands Electricity Board Showrooms, Derby, at 6.15 p.m. "Mining Subsidence. Design Problems and Remedial Measures," by K. Wardell.

Institution of Plant Engineers (London Branch):—Meeting at the Royal Society of Arts, John Adam Street, Adelphi, London, W.C.2, at 7 p.m. "Maintenance of Heat Exchangers," by H. B. Merriman

Institution of Plant Engineers (Peterborough Branch):—Meeting at the White Lion Hotel, Church Street, Peterborough, at 7.30 p.m. "Some Medium-sized Boilerhouses," by G. A. Rooley.

Institute of Marine Engineers (Devon and Cornwall Section):—Meeting at the Demonstration Theatre, South Western Gas Board, Radiant House, Derry's Cross, Plymouth, at 7.30 p.m. "The Future Doxford Marine Oil Engine," by P. Jackson.

Sheffield University Mining Society:—Meeting in the Mining Lecture Theatre, St. George's Square, Sheffield 1, at 5 p.m. Papers by two mining students.

Institution of Mechanical Engineers (North Eastern Branch):—Meeting at the Cleveland Scientific and Technical Institute, Corporation Road, Middlesbrough, at 6.45 p.m. "The South Works of Ashmore, Benson, Pease & Company, Limited," by T. K. Hargreaves.

MARCH 8

Royal Society of Arts:—Meeting at John Adam Street, Adelphi, London, W.C.2, at 6 p.m. "Technical Developments in the Steel Industry," by Sir Andrew McCance, FRS, chairman and managing director of Colvilles, Limited. Applications for tickets to the secretary of the RSA.

Society of Chemical Industry:—Joint meeting of the Corrosion Group and the Newcastle Section in the Northgate Hall, College of Further Education, Gladstone Street, Darlington, at 8 p.m. "Metal Spraying for the Protection of Bridge Structures," by J. D. Thompson (Cleveland Bridge & Engineering Company, Limited). There will be a visit to the Cleveland Bridge & Engineering Company at 2.30 p.m.

North Wales Metallurgical Society:—Joint meeting with the Royal Institute of Chemistry (North Wales Section) in the Lecture Theatre, Flintshire Technical College, Connah's Quay, near Chester, at 7 p.m. "The Present Position of Physical Chemistry in Steelmaking," by Sir Charles Goodeve, FRS.

Institution of Production Engineers (Preston Section):—Meeting at the Harris College, Corporation Street, Preston, at 7.30 p.m. "Recent Developments in the USSR," by Dr. D. F. Galloway, preceded by annual general meeting at 7 p.m.

MARCH 9

Manchester Geological and Mining Society:—Meeting at Wigan and District Mining and Technical College at 3.15 p.m. "Electrical Power in the Modern Colliery," by F. Loynes, chief electrical engineer, North-Western Divisional Coal Board.

Society of Instrument Technology (Liverpool Section):—Meeting at M.A.N.W.E.B. Industrial Development Centre, Liverpool, at 7 p.m. "Design, Application, and Selection of Automatic Control Valves," by P. Stone.

Institution of Mechanical Engineers (Yorkshire Branch):—Meeting at the Chemistry Lecture Theatre, The University, Leeds, at 6.30 p.m. "The Development of Multi-fuel Engines," by G. K. Martlew.

MARCH 10

Society of Instrument Technology (Midland Section):—Meeting at the Gosta Green College of Technology, Aston Street, Birmingham, at 7 p.m. "Control Problems of Nuclear Power Stations," by R. B. Quarmby.

Institution of Production Engineers (Ipswich and Colchester Section):—Meeting at Electric House, Ipswich, at 7.30 p.m. "The Status of the Production Engineer in Any Sort of Economy," by H. Burke.

MARCH 13

Institution of Mechanical Engineers:—Meeting organized by the Industrial Administration and Engineering Production Group at 1, Birdcage Walk, London, S.W.1, at 10 a.m. Informal discussion on "Human Capabilities and Limitations in Industrial Operations." Registration forms from the secretary of the institution.

Lincolnshire Iron and Steel Institute:—Meeting at the North Lindsey Technical College, Kingsway, Scunthorpe, at 7 p.m. Annual general meeting followed by young members' papers.

Institution of Electrical Engineers (East Anglian Subcentre):—Meeting at the Technical College, Cambridge, at 6.30 p.m. Discussion on "The Broadening of University Engineering and Science Courses," opened by Prof. H. E. M. Barlow.

Institution of Electrical Engineers (South Midland Supply and Utilization Group):—Meeting at the College of Advanced Technology, Gosta Green, Aston Street, Birmingham, at 6 p.m. "The Determination of the Electrical Characteristics of an Arc Furnace," by J. Ravenscroft.

National Association of Colliery Managers

MARCH 6

South Midland Branch:—Meeting at Ashby Rescue Station at 4 p.m. "The Instrumentation Work of the Mining Research Establishment," by A. E. Bennett.

MARCH 7

South Wales Branch:—Meeting at the Castle Hotel, Neath, at 6 p.m. "Recent Accidents and Safety Measures in the Mines of the South Western Division," by C. Leigh, HM Divisional Inspector of Mines and Quarries, assisted by A. L. Alexander, HM Electrical Inspector of Mines, and E. S. Worthington, HM Mechanical Inspector of Mines.

MARCH 8

Scottish Branch:—Meeting at the Royal College of Science and Technology, Glasgow, at 5.15 p.m. "Narrow Work—Past, Present, and Future," by R. B. Dunn.

MARCH 14

Yorkshire Branch:—Meeting at the Miners' Welfare Hall, Brodsworth, at 3 p.m. Film show.

MARCH 17

North of England Branch:—Annual informal dinner (men only) at the Old Assembly Rooms, Newcastle-upon-Tyne 1.

MARCH 20

Midland Branch:—Meeting at the Denman's Head Hotel, Sutton-in-Ashfield, at 6.30 p.m. Paper by W. E. Vance, ventilation engineer, No. 3 Area.

MARCH 22

Lancashire Branch:—Meeting at 40, Portland Street, Manchester. Discussion on "Methods of Roof Support in View of Impending New Regulations."

North of England Branch:—Meeting at the Mining Institute, Newcastle upon Tyne, at 6.45 p.m. "A Study of the Converter-driven Four-rope Friction Winders at the Theresa and Castlereagh Shafts, Dawdon Colliery," by D. L. Hunt.

MARCH 24

Yorkshire Branch:—Dinner and dance at the Danum Hotel, Doncaster.

Strip Steel from Iron Ore

SUCCESSFUL production of strip steel from iron ore, without melting, in its new research centre was announced recently by the Republic Steel Corporation. The strip steel rolling process uses iron powder and by-passes such normal production operations as coke ovens, blast furnaces, open-hearths, and blooming mills. There is, however, considerable research work ahead before commercial production will be possible.

The new process has the potential to reduce capital equipment and production costs while producing steel equal in quality to the steel made by conventional methods.

Steel has been made in the laboratory which offers the same strength, ductility, and ability to be fabricated into finished parts as steel produced by other methods.

Republic Steel's process consists of three major steps. First, iron ore is highly purified and reduced to metallic iron powder. Secondly, it is funnelled between four rolls, where it is compressed from a powder into a semi-solid strip by rolling. Finally, the semi-solid strip which emerges from the second step passes through a furnace, where it is heated to 1,200 deg. C. in a reducing atmosphere. It then passes on through a series of hot-strip rolling stands. This hot-rolling step reduces the thickness of the steel strip to the desired gauge and to full density and produces hot-rolled steel in coils.

The hot-rolled coils have the same quality as conventionally made steels.

After the hot-rolling and coiling operation, the steel then goes through the usual operations of pickling, cold rolling, and annealing before being recoiled or cut into sheets. Republic Steel has produced more than 1,800 lb. of steel by the new process in its laboratory. A model of the apparatus is shown in Fig. 1.

Electronic Aids for Industry

INSTRUMENTATION from 10 countries will be shown, much of it for the first time in this country, at the sixth International Instrument Show in London from June 19 to 23. Covering such varied fields as acoustic measurement, aircraft maintenance, nuclear analysis, radar, automation, and quality control, the exhibits will mirror many of the up-to-the-minute achievements of scientists engaged on electronics research in the UK, USA, Canada, Denmark, Sweden, West Germany, France, Switzerland, Holland, and Italy.

The show is to be staged at the Park Lane premises of B & K Laboratories, Limited, where the stands of over 50 exhibitors will cover an area of 2,500 sq. ft.

IRON-ORE EXPORTS through the new port installations of Rio de Janeiro rose to over 1,000,000 tons last year compared with 800,000 tons in 1959. This year, they are expected to reach 2,000,000 tons and there is expected to be a further increase, to 4,000,000 tons, in 1962. At present, the iron-ore quay has loading installations with a capacity of 1,000 tons an hour and can accommodate ships up to 21,000 tons. On completion of further dredging work, the quay will be able to accommodate ships up to 45,000 tons.

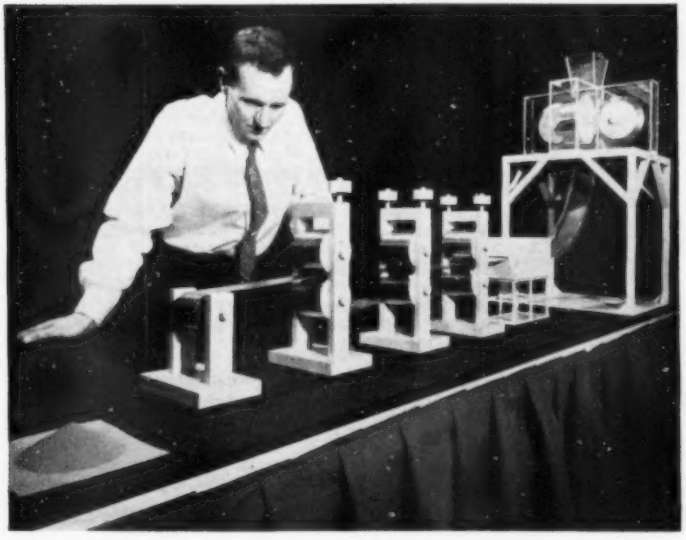


FIG. 1.—MODEL SHOWING THE OPERATING SEQUENCE OF THE REPUBLIC STEEL CORPORATION'S NEW STRIP ROLLING PROCESS. IN THE PROCESS, IRON POWDER IS POURED INTO THE FUNNEL AT UPPER RIGHT AND THEN IS COMPRESSED BETWEEN FOUR ROLLS ON THE TOP PLATFORM INTO A SEMI-SOLID STRIP. THE STRIP IS THEN PASSED THROUGH A HEATING FURNACE AND A SERIES OF HOT-STRIP ROLLING STANDS AND THEN COILED.

Iron-ore Mining in Finland

MINING activities in the modern sense and on a commercial basis began in Finland some three decades ago after the complete reorganization of the Outokumpu mine. Since then prospecting for ores has gradually increased and has resulted in the finding of several new ores of economic importance.

In an article in the Finnish Trade Review, published by the Finnish Foreign Trade Association, Helsinki, Dr. Vladi Marmo, director of the Geological Research Institute, says that a very important change in the progress of ore prospecting and mining took place some 10 years ago. This was mainly caused by the rapid increase of Government appropriations for geological work; the beginning (in 1951) of the regional airborne geophysical survey of Finland, and the establishment of ore prospecting departments in the mining companies. Thus, since 1950, six new mines have been opened, four of which still operate. In addition, there are three or four ores whose mining will start shortly.

Two Mines Operating

At present, only two iron mines are operating in Finland: Otanmäki, which is producing magnetite (iron ore), ilmenite (titanium ore), and vanadium pentoxide, which is extracted from magnetite using a chemical process mainly developed by the staff of the Otanmäki Company. The annual output of this mine is approximately 800,000 tons of ore, and the known ore resources are in the region of 30,000,000 tons. The whole output (excluding a very small amount of pyrite concentrate which is used by home pulp mills) is exported. Kärväsvaara is the second, but much smaller, iron-ore mine, which is based on approximately 1,500,000 tons of high-grade magnetite ore. Its annual output is 100,000 tons of crude ore, which is also exported.

There are several iron-ore deposits, among which Raajärvi, at Misi, in southern Lapland, with its reserves of 5,000,000 to 10,000,000 tons of good-quality ore, is expected to start operating within two years with an annual output of 300,000 to 400,000 tons. Kolari is the second iron-ore deposit which will probably be mined. It has a set of ore bodies, some consisting of hematite, others of magnetite, amounting to about 60,000,000 tons of poor- to medium-quality ore. This deposit is situated in western Lapland. Jussarö, near an island off the southern coast of Finland, is the third deposit under development as a mine. The magnetite ore here is poor but extensive, amounting to about 200,000,000 tons. The output expected is small.

An important contribution to Finnish iron-ore production will undoubtedly be the pyrite ore of Pyhäsalmi, north central Finland. This deposit will produce—probably in 1962—mainly pyrite, which will be treated in the factories of the Outokumpu Company at Kokkola. Native sulphur, sulphuric acid, and iron ore of high-grade quality will be produced and, as a by-product, the surplus heat will be converted into electric power. In addition, this ore contains some copper, zinc, and silver.

Outokumpu is Finland's oldest mine in operation and the most important copper producer of the country. Ore was discovered there in 1910. There is still sufficient copper-pyrite ore for approximately 17 years at an annual output of 700,000 tons.

Vihanti mine is the second largest copper producer in Finland, but is mainly a zinc mine which also produces some galena concentrate. This mine started operation in the early '50s. At present, the annual output of Vihanti amounts to 400,000 tons, and its reserves should be sufficient for some decades.

Ylöjärvi is a small mine producing copper and scheelite concentrate. In addition, some chalcopyrite concentrate is obtained from the sulphide mine of Kotalahti, which also produces some nickel ore. Korsnäs is a mine producing galena (lead) concentrate only. The mine started operation in 1960, and its ore resources are approximately 1,000,000 tons.

All chalcopyrite concentrates of Finnish mines are refined in factories at Harjavalta and Pori, owned, together with the above-mentioned mines, by the Outokumpu Company. Thus, electrolytic copper of the highest purity is produced and sold mainly as an end product of copper and copper-bearing alloys. The zinc and lead concentrates, as well as the small scheelite output, are entirely exported as concentrates. In addition, the copper refineries produce, as by-products, several tons of silver, some selenium, and gold. In addition to the pyrite deposit of Pyhäsalmi there is a possibility of reopening the mine at Metsämonttu.

A chromium ore deposit at Kemi has recently been discovered by the Geological Survey; its ore resources are considerable. The ratio of chromium to iron is too small, however, and the question of whether this ore will be utilized or not therefore depends entirely on the metallurgical investigations carried out by Outokumpu.

Special Hydraulics Course

ON April 27 a special one-day course, designed to outline the advantages and possibilities of oil hydraulic power and control systems in industry, is being held by Stein Atkinson Vickers Hydraulics, Limited, in the lecture hall at its new Birmingham district office. Applications are invited from management personnel responsible for making policy decisions on the design or marketing of industrial plant and machinery.

The course will deal with exploitation of hydraulic principles and their interpretation to meet varied applications, with time allowed for discussion on these methods and the economics, design, and overall considerations involved.

Applications should be addressed to the Engineering Lecturer, Stein Atkinson Vickers Hydraulics, Limited, 197, Knightsbridge, London, S.W.7.

Obituary

Mr. E. G. FUDGE

"A Friend of Colliery Managers"—And of all Miners

WELL-KNOWN in the mining industry for more than a quarter of a century to all who took an active interest in promoting higher standards of health and safety in mines and research into the dangers in mines, Mr. Edward George Fudge died on Friday of last week at the age of 73. His work brought him into frequent and close contact with the responsible leaders of all sections of the mining and quarrying industries, among whom he was held in high regard.

Educated at the William Ellis School, Mr. Fudge entered the Civil Service in 1904. For most of his working life he was attached to that department of the Government service whose main concern was the safety and health of all employed in mines and quarries—first to the Home Office, then, after 1920, to the newly formed Mines Department of the Board of Trade, and eventually, to the Ministry of Fuel and Power, now the Ministry of Power.

Promoted to the rank of Under-Secretary in the early 1930s, he remained the administrative head of the health and safety division of the Ministry until his retirement in 1948. At that time he was appointed chairman of the Safety in Mines Research (Advisory) Board—an organization with which he had been associated in one form or another practically from its inception. Health reasons compelled him a few years later to give up this work.

Recognition of NACM

At all times he showed a deep understanding and keen appreciation of the difficult job of the colliery manager and the heavy responsibilities he had to shoulder. He always sought and welcomed the views of the colliery managers on matters affecting the safe working of mines, especially matters which might become the subject of legislation or research.

Members of the National Association of Colliery Managers have many good reasons to remember Mr. Fudge, especially for the official recognition which he, soon after his appointment as an Under Secretary, willingly gave the association in all discussions relating to new safety legislation. He established a precedent which has been loyally followed by the Ministry ever since. To the NACM he was at all times a wise counsellor and a good friend. On his retirement he was the guest of honour at a luncheon given by some members of the council of the Association. On a presentation watch which he received on that occasion the inscription, which read: "From a few Colliery Manager friends to Edward Fudge—a Friend of Colliery Managers," gave him immense satisfaction.

MR. D. W. BARON

THE death took place last weekend of Mr. David W. Baron, a well known member of the National Association of Colliery Managers and a former member of the council of the North of England branch. Mr. Baron served his mining apprenticeship with the late Mr. F. L. Booth at Ashington Colliery, obtained his first-class certificate in 1926, and the following year went out to India and for nearly 19 years managed various collieries and groups of collieries.

After the war, in which he served with the Royal Engineers in the Burma Campaign, Mr. Baron returned to England and on nationalization was appointed assistant group manager, No. 1 Area, Durham Divisional Coal Board. After other appointments he became deputy production manager (operations) for No. 4 (South-West Durham) Area in 1955, but in 1958 went oversea again, this time as general manager of the Nigerian Coal Corporation, Limited, Enugu.

While in India Mr. Baron served on a number of mining and coal industry technical committees and was president of the National Association of Colliery Managers in India in 1938. In this country he had also taken a keen interest in the British Association of Colliery Management and had served as a member of the council of the North of England Institute of Mining Engineers.

MR. S. A. STANTON

SHIPPING director of Cory Bros. & Company, Limited, coal shippers, of Cardiff, Mr. Sidney A. Stanton died on Monday at Las Palmas, where he went to recover from a recent illness. He was 62. Although Mr. Stanton spent the whole of his business life with Cory Bros., and associated companies, he will be particularly remembered for his work in connection with the National Coal Board's large-scale chartering programme during 1954-56 when considerable tonnages were brought to this country from America.

He joined L. Gueret, Limited, in 1912, being appointed to the foreign coaling division. Following service with the Middlesex Regiment during the 1914-18 war, he re-joined the firm and spent three years at the Algiers depôt. On his return to this country, Mr. Stanton remained closely associated with chartering activity for the remainder of his life.

President of the Heat and Power Club, Sir OLIVER LYLE died last week at the age of 71. Since 1919 he had been managing director of Tate & Lyle, Limited.

and he took a keen interest in industrial matters having had his book "The Efficient Use of Steam" published by the Government in 1947.

The death occurred last weekend of Mr. THOMAS WALKER. He was 78. Until his retirement nine years ago, Mr. Walker was secretary of John Haigh & Sons, Limited, machinery manufacturers and ironfounders, of Huddersfield. He had served with the company for 37 years.

Mr. ANDREW MACALPINE, former president, general, financial and organizing secretary of the Scottish Area of the National Association of Colliery Overmen, Deputies, and Shotfirers, over a period of 40 years, died on Monday, aged 78. He was president of the association from 1938 until he retired from the office in May, 1953—a record term. Mr. MacAlpine began work in the pits at the age of 12 and for his services to the mining industry he was made OBE.

Memorial Service for Sir Charles Reid

MEMORIAL service to Sir Charles Reid, who died last week, was held at St. Columba's Church of Scotland, London, S.W.1, on Wednesday. Recalling Sir Charles' climb from a colliery clerk in Fife, to become one of the founder members of the National Coal Board, the Rev. G. T. Bellhouse, who conducted the service assisted by Rev. Dr. W. Macintosh, said Sir Charles remained completely unspoiled by his success.

"He was impatient of all woolliness of thought; of all slackness and inefficiency, yet he never lost a friend, because he had a big heart. The mining industry and our country have lost a distinguished man—many of us feel that we have lost a kind and warm-hearted friend," Mr. Bellhouse said. The lessons were read by Sir Andrew Bryan.

Among those present at the service were: Dr. William Reid (son of Sir Charles Reid, and chairman of the Durham Divisional Coal Board); Mr. C. de Peyer, representing the Minister of Power; Viscount Hindley, former chairman of the NCB; Sir Joseph Latham, former deputy chairman of the NCB; Sir Ernest Gowers, former chairman of the Coal Mines Reorganization Committee; Sir Charles Ellis, FRS, former scientific member of the NCB; Rear-Admiral H. R. M. Woodhouse, former chairman of the South-Eastern NCB; Mr. J. C. Gridley, former member of the NCB; Col. C. G. Lanchester, MP, chairman of the Conservative Backbenchers' Power Committee; Mr. R. A. Moore, president of the Institution of Mining Engineers; Mr. J. McDermid, secretary of the IME; Mr. D. W. Park, representing the National Association of Colliery Managers and the NACM Scottish branch.

Among the members of the National Coal Board were:—Mr. E. H. Browne, deputy chairman; Mr. C. A. Roberts; Mr. H. E. Collins, member for production and reconstruction; and Mr. R. G. C. Cowe, secretary. Mr. F. Wilkinson, director-general of marketing; Mr. A. H. Kellett, chairman, South-Western Division; Mr. R. Parker, chairman, Scottish Division; Mr. H. A. Longden, chairman, West Midlands Division; Mr. J. E. Plumptre, general manager, South-Eastern Division; Mr. G. C. Payne, reconstruction director, North-Eastern Division; Mr. R. S. McLaren, production director, Durham Division; Mr. B. H. C. Clark, secretary, East Midlands Division; Mr. F. W. Fry, general manager, No. 5 Area, Durham Division; and Mr. J. A. Nimmo, general manager, No. 6 Area, North-Western Division.

Yorkshire Miners Urged to Return to Work

"IT is an absolute tragedy that at this stage in our efforts and our strivings and struggling to preserve the mammoth coal industry for Britain, the unity and loyalty of the ordinary miners should be prostituted by those who seek to gain further rewards by action which is quite unconstitutional and, what is worse, by the breaking of agreements and solemn promises," said Mr. Alfred Robens, chairman of the National Coal Board.

Speaking in Leeds on Wednesday, Mr. Robens told the Yorkshire miners on unofficial strike that he would not give way to force, anarchy, or blackmail, and appealed to them to go back to work. His responsibility with regard to wage negotiations and conditions was a national one and he accepted full responsibility for any settlement on a national scale. When it came to piece-rate earnings these were matters which could not and should not be settled nationally. Therefore the Yorkshire strike was a matter which was in the capable hands of Mr. W. H. Sales, chairman of the North-Eastern Divisional Coal Board and Mr. Robens was 100 per cent. in agreement with the stand Mr. Sales had taken.

Commenting "with reluctance and regret" on the dispute earlier in the week, Mr. Sales said he did so at a time when some men were dashing from pit to pit endeavouring to provoke strikes. The issues tended to become confused and the public image of the Yorkshire mineworker distorted. He was not influenced by irresponsible statements or actions and "strike or no strike, threat or no threat, I will not be diverted from the task and responsibility of dealing with the present issues jointly with the Area NUM and by reference to the principles of what is fair, what is possible, and what can best be done to ensure the future prosperity of the Yorkshire coal industry and those whose livelihood depends upon it," he said.

By Wednesday it was reported that the strike had spread to 61 pits, 47 of which were totally idle, and nearly 60,000 men were affected. However, yesterday (Thursday), it was learned that the men at Manvers Main had returned on the afternoon shift the previous day and later, that men at nine pits had resumed normal working.

The dispute is understood to have concerned underground pieceworkers who demanded 10 per cent. more on all price list payments and a guaranteed shift wage of 65s. The effect of the strike has been felt in Yorkshire and Lancashire where a temporary system of rationing prevented a total lack of supplies. The North-Eastern Divisional Coal Board stated that it was arranging for supplies from other coalfields. Train loads would be rationed among merchants.

Recent Wills

THOMAS, PROF. W. N., Emeritus Professor of Engineering, University College, Cardiff £27,290

PARK, W. H., former director of Harland & Wolff, Limited, shipbuilders etc., of Belfast £25,580

PEIRSON, G. F., former commercial manager of the United Coke & Chemical Company, Limited ... £8,697

COOPER, WILLIE, for many years undermanager at the Furnace Hill and Renishaw Park collieries and later safety officer at Orgreave Colliery, Handsworth, Sheffield £1,691

COWAN-DOUGLAS, HUGH, chairman of Glenfield & Kennedy, Limited, Harland Engineering Company, Limited, and Blackett, Hutton & Company, Limited, and a director of Carntyne Steel Castings, Limited, and other companies £68,998

IRON AND STEEL TRADE

PRODUCERS of heavy steel products are still hoping that the present tendency to limit forward ordering of sections, joists, and plate is due only to a temporary reduction of stocks held by consumers and merchants. It would seem that from mid-May onwards the demand for these categories will take a downward trend unless, in the meantime, the flow of specifications issued for deliveries towards the end of the second quarter and into the latter half of the year improves. Shorter delivery dates for medium plate are already being quoted.

Pig-iron

All grades of pig-iron are easy to come by and for the production of high quality castings, which are, comparatively, in greatest demand, the low phosphorus irons continue to be taken up in substantial quantities. Apart from one or two brands, consumers are able to obtain all the supplies required. Appreciable quantities of hematite are also being taken up.

Outputs of the high phosphorus irons are more than adequate to satisfy current requirements and there is a steady export trade which could be considerably increased were it not for the severe competition from makers abroad.

Ferro-alloys

Ferro-tungsten is unchanged in price and demand has reverted to a fairly steady level. Ferro-vanadium is active, and ferro-molybdenum is of moderate interest. The 45 per cent. Si and 75 per cent. Si grades of ferro-silicon continue to attract attention and ferro-chrome also is active. There is a steady demand for calcium-silicide, while ferro-manganese and silico-manganese are reasonably supported.

Ferro-niobium and ferro-titanium are in fair request and silicon metal is more active than of late. Chromium metal attracts steady support.

Semi-finished Steel

Most of the re-rollers are able to obtain appreciable outputs of their products, although there is reduced production at some works. However, this is mostly the backwash from the car industry recession and will probably be of short duration. Orders previously booked by the re-rollers for small bars and light sections have enabled them to maintain production levels. The call for reinforcing rods and bars continues keen.

Mild steel semis are in good supply and the re-rollers are amply provided with billets, blooms, and slabs in this grade of steel. Carbon and alloy steels are, however, not so plentiful.

Finished Steel

There is some restriction in ordering and even reports of cancellation of certain orders. For some sizes, additional tonnage can be accepted, but the general effect on the steel mills is very slight as any additional tonnage required to fill up the gaps is quickly accumulated. The current call for plate of all kinds is sufficient to maintain normal production and makers are optimistic as to future demands.

The improvement in the car industry has not yet been reflected in the demand for cold reduced sheets and approved specifications can be assured of fairly prompt delivery, as can orders for flat and galvanized sheets, cold reduced strip, and good commercial quality bright bars.

Work Starts on £33,000,000 Park Gate Steel Plant

WORK began last Friday on the new £33,000,000 steelworks at Aldwarke, Rotherham, of the Park Gate Iron & Steel Company, Limited. Lord Plowden, deputy chairman of Tube Investments, Limited, the parent company, cut the first turf, and afterwards earth-moving machines began levelling the site. The new works will include a steel-making department, a blooming mill, a continuous billet mill, and a continuous strip mill. The work will take about three years to complete, and the development will provide employment for 1,000 workers.

Lord Plowden described the present development as part of a continuous process of modernization which had been going on since the ironworks were founded at Park Gate nearly 140 years ago. The ceremony was watched by Mr. C. H. T. Williams, chairman of Park Gate Iron & Steel, and Master Cutler of Sheffield, and Viscount Marchwood, a director of George Wimpey & Company, Limited, the contractors responsible for the site.

"Don't Sell RTB" Call by MPs

MOTION has been signed by 12 Labour MPs in the Commons calling on the Government to declare that it will not sell Richard Thomas & Baldwins, Limited, into private hands during the life of the present Parliament. The motion notes "the fine trading figures of this publicly owned company for the last financial year, in that it made a net profit before taxation, of £11,188,733."

It goes on to "deeply regret" the additional strain on the management, staff, and workpeople caused "by the time and thought that has had to be given to work, argument, and discussion on possible schemes for devesting the company."

UNIVERSAL ASBESTOS MANUFACTURING COMPANY, LIMITED—Mr. Frank W. R. Douglas, chairman, states: "It is hoped that the company will not only hold its own in the current year, but will continue to prosper as before. The demand for industrial buildings, the group's main outlet, may in the long term tend to fall, but 1960 approvals for this type of building were double those of 1959." Group profit for 53 weeks to October 2, 1960, was £363,640 (£313,800), after tax of £362,569 (£219,465), and the dividend is raised from the equivalent of 9d. to 1s. per 5s. share on capital doubled by a scrip issue. A further one-for-four scrip issue is proposed.

Coalfield News

Coal Board Clerks Win Wage Increases

UNION representatives have agreed at a meeting with the National Coal Board to recommend to their branches an increase of 8s. 6d. a week for clerks, typists, and machine operators, and £25 a year for the higher grade of clerical officer, an NCB spokesman has stated. The increases for clerks would take effect from January 1 last and those for clerical officers from January 2.

The negotiations followed the unofficial strike of 3,000 clerical workers in the South Wales coalfield last week. It began on Monday and originated in a dispute at the Tredegar offices of the South-Western Divisional Coal Board.

NEW PITHEAD BATHS erected at Whittonstall Drift, Chopwell (Co. Durham), were brought into operation on Monday.

DIVISIONAL FINALS in the annual first-aid competition organized by the Durham Divisional Coal Board, will be held on March 25.

Mr. W. H. ELLISON, mechanical engineer for Group "A" No. 4 Area of the Durham Divisional Coal Board for 14 years has retired.

AFTER NEARLY 50 years' service on the administrative side of the mining industry in the Rhymney Valley (Mon), Mr. E. G. Davies has retired.

LEICESTERSHIRE MINERS have won a claim for 1s. a day to be paid to pieceworkers and taskworkers in pits for carrying flame lamps used to detect gas.

COAL AND COKE SHIPMENTS from the South Wales ports last week totalled 50,260 tons, compared with 61,039 tons in the corresponding week of 1960.

WEST AYR AREA junior ambulance contest was won by Auchincruive Nos. 4/5/6/7 Colliery team, all the members of which won individual prizes. The Alloa Area junior competition was won by Kinneil "A" team.

GIFT of £10 each and certificates for 50 years' unbroken membership of the Durham Miners' Association were presented to 11 retired miners of the Hetton Lodge of the NUM at the weekend. They also received National Coal Board long-service plaques.

SO THAT IT can explore coal reserves, which can be mined from Ryhope Colliery, Co. Durham, the 180-ft. sea-boring tower, which has been in position off the mouth of the Tyne for 15 months, has been moved to a new position two miles out to sea near Sunderland. The tower has been stationed off several parts of the north-east coast during the past two or three years, to prove seams which will be worked by local pits.

LICENCE AND TECHNICAL assistance agreement between the Fairfield Shipbuilding & Engineering Company, Limited, Glasgow, and the Westinghouse Electric International Company, of New York, gives the Fairfield Company exclusive manufacturing rights, within the UK, for marine turbines incorporating Westinghouse techniques. It also permits sub-licensing to other turbine builders in this country. In 1958 the Fairfield Company formed a nuclear marine propulsion consortium with Mitchell Engineering, Limited, Peterborough, and Combustion Engineering, Inc., New York.

Rebel Winding Enginemen's Union to Woo NUM Members

ENGINEMEN, who operate the pithead winding gears at collieries throughout the Welsh, Scottish, Durham, and Kent coalfields, are to be invited to leave the National Union of Mineworkers and join a new national trade union. They are to be approached by officials of the Yorkshire, Derbyshire, and Nottinghamshire Winding Enginemen's Association, which last year was expelled from its affiliation with the NUM.

Explaining the position, Mr. William Jackson, secretary of the association, said: "We feel that at present we are not receiving sufficient consideration from either the other unions or the National Coal Board. Some progress has been made towards the formation of a national union, but there is a lot of spadework yet to be done."

At a meeting in Derby last Friday, Mr. Frank Cope was elected acting president, Mr. Charles Guest secretary, and Mr. W. C. Jackson, acting treasurer, of the proposed union.

The rebel union has been strongly criticized by Mr. Will Whitehead, the NUM South Wales leader. He said: "I sincerely hope that winding enginemen will treat this information with the contempt it deserves. Our relations in South Wales are most cordial. I am quite certain that the NUM is the best organization to represent the interests of enginemen and all grades in the pits apart from officials."

On Sunday at Chesterfield (Derbyshire), a mass meeting of the Amalgamated Central Association, the union for colliery underofficials, backed the rebel union in its fight for recognition by the National Coal Board.

Mr. Edward Pickard, president of the Nottinghamshire and Derbyshire Winders, said that if the winders failed to gain NCB recognition he would recommend that they joined the ACA. Mr. E. Wood, the acting president of the ACA, added: "An amalgamation would make up the strongest union in the area. We could battle on until recognition came."

Pit "Smuggling" Dying Out

"OVERWHELMING majority of our 2,000-odd workers now recognize the insanity of risking what amounts to suicide and murder rather than go for eight hours without a smoke," said Mr. James Miller, chairman of the Michael Colliery (Fife), branch of the National Union of Mineworkers, commenting on the annual report of the branch. The report says that during 1960 there was no case of anyone smoking while underground.

Mr. Miller's remarks are supported by the other collieries in the Fife Area. Fewer and fewer miners were taking the risk of the sack, plus heavy fines or imprisonment for the sake of a "fly puff at piece time," Mr. John McArthur, Fife Area secretary of the NUM, said.

Mr. P. LAMBERT has been appointed head of the engineering section of the British Steel Castings Research Association.

BROOKE TOOL MANUFACTURING COMPANY, LIMITED—Mr. A. Crockett has joined the board. He has been with the company for nearly 20 years and became works manager two years ago. Mr. J. Lamb, chief accountant, has been appointed a director and chief accountant of the subsidiary, Brooke Tool Automation, Limited.

THE COAL TRADE

ALTHOUGH the milder weather brought considerable easing of the pressure on merchants so far as deliveries and the pile-up of orders were concerned, collieries have experienced no difficulty in disposing of available supplies, particularly of the better qualities. The news that a determined effort is to be made to boost the supply of anthracite is welcome and cannot be made too soon. Throughout last summer there was never a surfeit and it is unlikely that the coming summer will see any improvement unless much more anthracite is readily available.

SCOTLAND

Glasgow—The unusually mild weather has proved very helpful in maintaining a comfortable balance between supply and demand. Earlier in the year house coal merchants had good grounds for fearing an acute shortage by this time because of an unexpectedly high rate of disposals in conjunction with a planned fall in output from the pits. While the latter factor remains in evidence, retail sales are easing and the situation is indicated by a stock of 147,000 tons at the depots compared with 117,000 tons a year ago. Margins are still narrow, however, and firms which ran through their stock early have difficulty at times in obtaining all the tonnage they require.

Pressure on anthracite and other alternative domestic fuels has eased, although only gas coke is readily available. The premier smokeless manufactured fuels are tight, and hard coke nuts are less plentiful than they were a few months ago. A shipment of anthracite from Ireland was discharged last week at Ayr for distribution to the trade in that area.

In the industrial range the effect of the mild weather has been particularly noticeable at the power stations where heavy throughputs have been met and stock improved at the same time. Since the beginning of the year consumption has been 10,000 tons a week, or more than 10 per cent., higher than last year, and to cover the position supplies have been coming by sea, road, and rail from the North of England. The last dispatches being made last week. Because of depleted reserves—240,000 tons compared with 436,000 tons last year—strong pressure for supplies of washed and untreated smalls will be maintained by the electricity works for a long time to come. In the meantime, a good demand also prevails for trebles, doubles, singles, pearls, and duff. Coking smalls are a strong market to support a steel output which is averaging last year's. Foundry coke is easier, but furnace grades are in keen demand.

Fife and Lothians—Production in both zones remains steady, and a corresponding business is passing for all grades. Mild weather has reduced the urgency for deliveries, but there is no surplus. Export business is restrained.

LOTHIANS NCB RESCUE COMPETITION

SILVER challenge cup for the annual competition at the Heriot-Watt College mine rescue station was awarded on Saturday to Prestongrange Colliery brigade. Ten rescue brigades from collieries and oil shale mines took part in the contest which was judged by Mr. D. Richards, HM Inspector of Mines, Mr. W. K. Dyer, superintendent of the Coatbridge Mine Rescue Station, and Dr. C. E. Watson, medical officer of the Lothians Area of the Scottish Divisional Coal Board.

Dalkeith Colliery brigade won the oral test, and Prestongrange won the reviver test and the galley test.

Coal Stocks Come into Their Own

COAL stocks are still the main talking point and, indeed, have assumed considerable importance in the light of the crippling dispute in the Yorkshire coalfield. In the week ended February 18 undistributed stocks dropped by over half a million tons to 24,981,000 tons and are now almost 10,000,000 tons below the comparable level last year. Consumers' stocks have steadied at around 11,800,000 tons, only merchants' stocks of house coal having dropped to the narrow margin of 1.1 winter weeks' consumption.

There were 582,750 wage-earners on colliery books on February 18, against 624,690 on February 20, 1960, the numbers engaged at the coal face being 219,490 and 239,180 respectively. Total absenteeism (all workers) in the week ended February 18, was 17.83 per cent., compared with 15.34 per cent. in the week ended February 20, 1960. Output at the face was 4.106 tons and overall 1.439 tons in the week ended February 18, compared with 3.938 and 1.404 tons in the week ended February 20.

The following table gives (in tons) the revised output of saleable mined coal by division in the week ended February 25, and the tonnage lost through all causes (holidays, disputes and go-slows):—

Division.	Week ended February 25, 1961.		Week ended February 27, 1960.
	Total output.	Tonnage lost.	Total output.
Scottish	348,000	8,000	369,000
Northern (N&C) ..	244,000	—	246,000
Durham	456,000	1,000	477,000
North-Eastern ..	742,000	99,000	843,000
North-Western ..	241,000	6,000	270,000
East Midlands ..	898,000	1,000	932,000
West Midlands ..	290,000	—	302,000
South-Western ..	375,000	3,000	409,000
South-Eastern ..	33,000	—	23,000
Great Britain—			
Deep-mined coal ..	3,627,000	118,000	3,871,000
Other deep-mined (including licensed mines) ..	40,000	—	52,000
Open-cast coal ..	187,000	—	151,000
TOTAL	3,854,000	118,000	4,074,000

LARGE-SCALE manufacturing facilities, costing more than £100,000,000, are to be set up by Imperial Chemical Industries, Limited, within the European Common Market during the next 10 years. The main project will be a complex of chemical plants near Rotterdam with smaller units in other parts of the Common Market.

Board Changes

Third Generation Takes Over at Crofts Engineers

FOLLOWING the death of Sir Charles Croft, his son, Mr. John Arthur Croft, has been appointed chairman of CROFTS ENGINEERS (HOLDINGS), LIMITED, parent company of the group of engineering companies founded by his grandfather in Bradford (Yorks).

MR. J. A. CROFT

Mr. Croft was educated at Uppingham and served in the Indian Army during the war. He joined the board of Crofts (Engineers), Limited, in 1944, and the board of the holding company when it was formed four years later. He succeeded his father as managing director of Crofts Engineers (Holdings) in 1954, at the same time being appointed deputy chairman. Mr. Croft has also assumed the chairmanship of the group's principal operating subsidiaries, including Crofts (Engineers) and Carter Gears, Limited.

N. HINGLEY & SONS, LIMITED—Mr. M. C. Lloyd has been appointed a director.

STENT PRECAST CONCRETE, LIMITED—Mr. H. A. Warren has been appointed a director.

W. J. JENKINS & COMPANY, LIMITED—Mr. R. M. Caddick has been appointed to the board.

S. H. LOCK & COMPANY (HOLDINGS), LIMITED—Mr. P. M. Low has been appointed a director.

RYE-ARC, LIMITED—Mr. George Jailler, marine general manager, has been appointed marine director.

BLACKSTONE & COMPANY, LIMITED—Mr. Ernest Joyce, director and secretary, and Mr. Charles Pratt are to retire from the board.

KONTAK MANUFACTURING COMPANY, LIMITED—Mr. Eric Skeith, secretary, and Mr. Joseph V. Nussey, works manager, have joined the board.

ACROW (ENGINEERS), LIMITED—Mr. Walter Grunebaum has been appointed an executive director. He is already a director of Acrow France, SA.

WESTINGHOUSE BRAKE & SIGNAL COMPANY, LIMITED—Due to increased business commitments, Mr. G. W. H. Richardson has resigned from the board.

COVENTRY GAUGE & TOOL COMPANY, LIMITED—Mr. W. R. L. Warnock, a director of the subsidiary, Rockwell Engineers, Limited, has joined the board.

MILFORD DOCK COMPANY, LIMITED—Mr. A. S. Bartlett has been appointed managing director in succession to Mr. L. J. Barnett, who has resigned from that position, but remains on the board.

POWELL DUFFRYN, LIMITED—Mr. G. A. H. Jones, managing director of Stephenson Clarke, Limited, and Mr. S. J. L. Hill, managing director of Cory Bros. & Company, Limited, have been elected to the board.

PIRELLI-GENERAL CABLE WORKS, LIMITED—Sir Leslie Gamage, who recently retired as chairman of the General Electric Company, Limited, continues to act as chairman. Mr. R. H. Phillips has joined the board.

SOLARTRON ELECTRONIC GROUP, LIMITED—Mr. L. Malec has joined the board as systems sales director. Mr. R. Catherall has been appointed research and development director and Mr. H. D. Binyon has been appointed product sales director.

CRITTALL MANUFACTURING COMPANY, LIMITED—Mr. E. J. Peel-Yates has been appointed home sales director in succession to Mr. Victor Attwood, who has passed retiring age. Mr. Attwood, who joined the company 40 years ago, retains his seat on the board.

MANCHESTER SHIP CANAL COMPANY—Sir Leslie Roberts, chairman and managing director will retire as managing director on March 31. He will continue as chairman and retains his directorships of a number of companies, including Williams Deacons Bank, Limited, and Hick, Hargreaves & Company, Limited.

J. G. STATTER & COMPANY, LIMITED—In succession to the late Lt.-Col. G. S. Marston, Mr. Peter Jardine has been appointed managing director of the company and of Minerva Mouldings, Limited, both members of the Metal Industries, Limited, group. He joined MI as group chief accountant in 1956, being appointed group financial controller three years later. He recently took up full time executive director duties with the two companies of which he is now managing director.

DERBYSHIRE STONE, LIMITED—Mr. John Hadfield, who had been managing director since the company began trading in 1936 and chairman since 1945, has relinquished the office of managing director and becomes executive chairman. He is succeeded as managing director by Mr. Harold Fletcher who joined the board in 1946 and has been deputy managing director since 1949. Mr. George Henderson has been appointed assistant managing director jointly with Mr. John W. Hobday.

ROSE BROS. (GAINSBOROUGH), LIMITED—Following the merger of the company with Forgrove Machinery Company, Limited, a wholly-owned subsidiary of Baker Perkins, Limited, Mr. R. H. Wilkins, joint managing director of Baker Perkins, has been appointed managing director. Mr. A. I. Baker, chairman of Baker Perkins, Mr. N. Mountain, a director, and Mr. W. A. B. Brown, deputy managing director of Forgrove, have joined the board. Mr. H. S. Ridley will continue as chairman and has joined the Forgrove board.

Levy on Industry Urged to Finance Training Schemes

INTRODUCTION of a training levy on industry as a whole to help finance better training of apprentices is urged in a report entitled "The Young Idea," issued by the Young Conservative and Unionist Organization. The report suggests that the whole industrial apprenticeship system is archaic, and should be re-examined in the light of the changing requirements of modern industry. The proposed industrial levy would help to finance the creation of group training schemes for smaller firms, provide direct grants for apprentices, and perhaps also be distributed to firms in proportion to the apprentices employed.

"This suggestion involves administrative difficulties, and it must avoid penalizing firms who do a good job in training apprentices," says the report, which also suggests that the powers of the Industrial Training Council over training as a whole should be strengthened. The report is the first to be published as a result of the plans of Mr. R. A. Butler, Home Secretary, to seek the views of Young Conservatives on various policy subjects.

Company News

'English Electric Expects—'

WARNING BY LORD NELSON OF STAFFORD

ENLARGING upon some significant figures in the breakdown of every £100 of 1960 sales turnover, Lord Nelson of Stafford, chairman of the English Electric Company, Limited, in his annual review, emphasizes that firms supplying raw materials or components must also concentrate on cost reduction. The breakdown shows that out of every £100 the cost of raw materials and manufactured accessories amounts to over £48. Lord Nelson maintains that firms supplying must share the responsibility of obtaining for this country some of the oversea business now being lost to foreign competitors.

He goes on to comment that the Government's medium term export credit insurance period is often not long enough for capital goods and too expensive as compared with facilities offered by other countries. What were previously regarded primarily as British markets were now scenes of intense international competition and many countries were progressively manufacturing the goods formerly bought from Britain. He welcomed these changes and as he believed they offered even greater opportunities for export of capital goods in the future.

Output of the group for 1960 was almost identical with that for 1959, but orders booked last year were substantially higher than ever before and there were good prospects for an increased output in 1961. The establishment of factories in Canada, Australia, South Africa, and India enabled a selling organization to be maintained to meet the needs of those countries and to deal with special projects involving the importation of British equipment.

Jackson Bid for Bretts' Stamping

ACTING on behalf of J. & H. B. Jackson, Limited, metal merchants, of Coventry, Neville Industrial Securities, Limited, has made an offer worth nearly £500,000 for the £200,000 ordinary capital of Brett's Stamping Company, Limited, also of Coventry. The offer, is 15s. cash plus six Jacksons ordinary 1s. shares for each Brett's £1 ordinary share.

Jackson directors have satisfied Neville Industrial Securities that the £150,000 cash part of the consideration, assuming full acceptance, will be available when required.

In the event of the offer becoming unconditional, accepting holders in Brett's, who do not wish to retain the Jackson ordinary, will be able to sell them to Neville Industrial at 5s. per share cash. Such holders would thus receive 45s. cash for each Brett's ordinary.

If the directors of Brett's do not feel able to recommend the offer, the directors of Jackson have nevertheless instructed Neville Industrial to send the offer to holders direct, and if no other arrangements have been made in the meantime it is proposed to do so after March 13.

INCANDESCENT HEAT COMPANY, LIMITED—In connection with the formal offer for the ordinary capital by the Wellman Smith Owen Engineering Corporation, Limited, a one-for-one scrip issue is recommended. It is proposed that the new ordinary, other than holders of Incandescent who do not accept the offer, shall be allotted direct to Wellman.

WILLSON LATHES, LIMITED—Interim dividend of 5 (10) per cent. is to be paid for the year ending March 31, 1961. The board states that this should not be taken as an indication of the final dividend.

BERALT TIN & WOLFRAM, LIMITED—An extra-ordinary general meeting has been called for March 17, 1961, to consider the amendment of the articles of association with regard to pension and superannuation schemes.

MATHER & PLATT, LIMITED—Group profits for 1960 were £1,316,774 (£1,522,972) but the dividend is maintained at 11 per cent., with an unchanged 8 per cent. final. After tax of £622,040 (£670,544), the net balance is down from £852,428 to £694,734.

STANDARD RANGE & FOUNDRY COMPANY, LIMITED—Final dividend of 13¼ per cent. makes 20 (equivalent 18.6) per cent. for 1960. Group net profits were £63,293 (£70,709), after tax of £63,012 (£51,723). The company was made public in October, 1959.

H. & J. HILL (WILLENHALL), LIMITED—With a 20 per cent. final total dividend for 1960 is being increased from 22½ per cent. to 27½ per cent. Profits rose from £14,994 to £41,433 and after tax of £20,090 (£6,681), the net balance is £21,343 against £8,313 previously.

THOMAS BOLTON & SONS, LIMITED—Payment for 1960 is being raised to 12½ (10) per cent. by adding a 2½ per cent. bonus to an unchanged final dividend of 7½ per cent. Trading profit, etc., increased to £448,067 (£286,690) and the net profit is up to £195,388 (£92,993).

CANNON (HOLDINGS), LIMITED—Technical difficulties and the credit "squeeze" resulted in a loss of £169,410 in the 15 months period ended September 30, 1960, after tax of £3,856. The previous year saw a profit of £63,635, after tax of £78,841. No dividend is to be paid for the 15 months period.

FOLLSAIN, LIMITED (formerly Follsain-Wycliffe Foundries, Limited)—Final dividend of 10 per cent. makes 15 (12½) per cent. for 1960. It is proposed to make a one-for-three rights issue, at a price to be decided, to facilitate the expansion of the business. Group net profit was £38,832 (£21,435), after estimated tax of £45,003 (£21,377).

PADLEY & VENABLES, LIMITED, makers of pneumatic tools for mining and other industries, of Dronfield, near Sheffield—Group trading profits rose to £202,965 (£169,061) and the dividend is raised from the equivalent of 12 per cent. to 14 per cent., with a 10½

per cent. final. Tax, after adjustments, absorbs £109,568 (£74,238), leaving a net profit of £93,397 (£94,823).

CLARKSON (ENGINEERS) LIMITED—Final dividend of 12½ per cent. makes 20 per cent. (equivalent 16 per cent.) on increased capital for the year ended November 30, 1960. Group net profit was £212,040 (£137,623), after tax of £205,801 (£133,250). Additional profits were due to increased turnover, better export performances, and more efficient rise of production facilities.

B.H.D. ENGINEERS, LIMITED—For an undisclosed sum the company has bought the Constructional Engineering Company, Limited, Birmingham, and its subsidiaries, E. Tallis & Sons, Limited, and Adaptable Moulding Machine Company, Limited, from the executors of the late Mr. D. Howard Wood. The new board of Constructional Engineering is: Mr. F. Brian Holmes, chairman; Mr. F. H. Hoult, managing director; Mr. P. Rushworth, Mr. S. Farrer, and Mr. J. F. Wigley.

INTERNATIONAL COMBUSTION (HOLDINGS), LIMITED—Value of orders received during the year ended September 30, 1960, showed a reduction, but the overall prospect has recently improved considerably. Group output fell by about 13 per cent., but the turnover still remained high compared with the capital employed, states the chairman, Sir James Reid Young. Group net profit, was £1,027,898 (£1,728,639), after tax of £847,720 (£1,269,697), and the dividend is maintained at 30 per cent.

LAPORTE INDUSTRIES, LIMITED—With a view to the acquisition of not less than 90 per cent. of the issued share capital of Howards & Sons, Limited, the capital is to be increased to £16,041,250 by the creation of 472,500 additional 5¼ per cent. cumulative second preference shares of £1 each and 2,137,500 ordinary shares of 10s. each. The capital is also to be further increased to £18,500,000 by the creation of 4,917,500 additional ordinary shares of 10s. each. An extraordinary meeting is to be held on March 13.

HALL-THERMOTANK, LIMITED—Despite intensifying competition, Mr. J. Willis, chairman, is confident that adverse factors such as the dearth of new ship construction and increased foreign activity will be more than offset by the group obtaining a still larger share in the industrial refrigeration business and by progress in the elevator market. Group profit for the first full year of group operations ended September 30, 1960, was £428,815 (£380,900), after tax of £778,220 (£549,516), and the dividend is raised from 6d. to 6¼d. per 5s. share.

Social Effects of Automation

FIRST British conference to consider the purely social and economic effects of automation, which will be held in Harrogate from June 27-30, will be opened by Viscount Hailsham, Minister of Science. Sponsored by a committee of eight of the member organizations of the British Conference on Automation and Computation, it will have as its title "Automation —Men and Money."

Among speakers who will consider the social aspect in the wider context of automation will be Mr. W. J. Carron, president of the Amalgamated Engineering Union, and Mr. E. F. Schumacher, economic adviser, National Coal Board. Mr. A. L. Stuchbery, chief technical engineer, Metal Box Company, Limited, will be among speakers covering the social implications within firms.

In Parliament

Disposal of Steel Companies' Prior Charges

RETURNING to the attack on the Government's disposal of the assets held by the Iron and Steel Holding and Realisation Agency, the Opposition, through MR. FREDERICK LEE (Lab.) suggested that the Government was bound to drop at least £20,000,000 on the transaction unless there were "changed considerations" which would yield a financially adequate return.

The CHANCELLOR OF THE EXCHEQUER, Mr. Selwyn Lloyd, again refused to accept that the Government was dropping £20,000,000. The books showed a profit of £5,000,000 with regard to the four companies whose equity and prior charges fund have been realized.

What must be understood, he told MR. DOUGLAS JAY (Lab.) was that when one was trying to disengage from a nationalization project as disastrous as the one carried out by the Labour Government, it took time and it had taken time to dispose of the equities. "It is a major operation to dispose of these prior charges which has taken a very long time to arrange."

MR. LEE said that owing to the unsatisfactory nature of the reply he would attempt to move the adjournment of the House at 3.30 p.m. to raise the matter.

MR. GERALD NABARRO (Con.): "That's a forlorn hope."

DIAGNOSIS OF PNEUMOCONIOSIS

ASSURANCE that all persons appointed to the pneumoconiosis medical panels would be given the fullest advantage of all the latest information and knowledge concerning the disease thereby ensuring proper diagnosis as far as humanly possible, was given by MR. JOHN BOYD-CARPENTER, Minister of Pensions, to MR. WILLIAM STONES (Lab.).

MR. STONES had maintained that there was "grave concern" in the coalfields over the number of miners whose chest complaints had been wrongly diagnosed. There was, the Minister said, considerable and impressive research work being undertaken by the Medical Research Council's establishment at Llandough.

COAL DUST REGULATIONS

FURTHER research into the problem of coal dust explosion was taking place both here and abroad and existing regulations would be suitably amended in the light of any new knowledge that accumulated, MR. RICHARD WOOD, Minister of Power, told MR. WILLIAM STONES (Lab.). The questioner had asked whether in the light of the report on the Six Bells disaster the present regulations were considered adequate.

MR. WOOD pointed out that the recent regulations requiring the erection of stone dust barriers on conveyor roads would increase safety in the mines. He thought it was too early to think of amending regulations which had come into force only five months previously.

GREAT DEAL of research into improved studies in coal technology at universities and colleges of advanced technology was already being supported by the Department of Scientific and Industrial Research and the University Grants Committee and it was hoped to make direct representations to the universities and colleges concerned, the Minister of Power told Mr. T. F. Peart (Lab.).

NEWS IN BRIEF

AGREEMENT HAS BEEN REACHED between Adrema (Holdings), Limited, London W.3, and Siemens & Halske, AG, Munich, to market the Productograph data writing system.

NEW RANGE of aluminium engines is being produced by Villiers Engineering Company, Limited. The scheme is part of a £2,000,000 four-year expansion programme which began last April.

SALES CENTRE has been opened by Griffin & George, Limited, at Clothier Road, Brislington Trading Estate, Bristol, 4 (telephone: Bristol 70346; Telex: 44267). It is under the management of Mr. W. J. Smith.

DONATION OF £1,000 from the Sheepbridge Engineering Company, Limited, of Chesterfield, has brought the total raised by the Mayor of Chesterfield's appeal for the King George V Jubilee Trust Fund up to £1,430.

WEARING OF stiletto heel shoes by 450 typists, clerks, and other female staff, has been banned by Steel, Peech & Tozer, branch of the United Steel Companies, Limited, because of the "great amount of damage" to floors.

NEWCASTLE DEPOT of Pritchett & Gold & E.P.S. Company, Limited, makers of Dagenite batteries, has been transferred to 20, Bankwell Lane, Off High Level Bridge Approach, Gateshead-on-Tyne, 8 (telephone: Gateshead 70034).

NEW MANAGEMENT development course is to be provided by Churchill College from September, 1961, designed to meet requirements formulated jointly by the Institution of Electrical Engineers and the British Institute of Management.

NEW AUSTRALIAN steel group—T. H. Bentley Holdings Proprietary, Limited—has been formed by Adam & Harvey, Limited, The Auto Invera Group, Limited, and T. B. Bentley, Limited. The new company has an authorized capital of £A200,000.

FOLLOWING the announcement last week that authorization had been given to US manufacturers to send machines for the manufacture of ball bearings to Russia it is now stated that the Department of Commerce has stopped despatch of the order.

SLIDE FASTENER FACTORY of Imperial Chemical Industries, Limited, at Waunarllwyd, Swansea, is to be closed. The plant is to be transferred to Witton, Birmingham, over a period of 18 months. About 600 workers, chiefly women, will become redundant.

AUSTRIAN FERROUS METALS production figures for 1960 show a total output of 2,232,000 metric tons of pig-iron—21.5 per cent. above the 1959 figure—and 3,161,000 tons of raw steel, an increase of 25.8 per cent. This production represents a *per capita* production of 451 (359) kilogrammes.

WHILE WATCHING the top of a nuclear reactor being cast at a foundry at Vasteraas, Sweden, Sir John Coulson, the British Ambassador, and his wife, had to run to safety when a ton of molten iron fell from a truck and ran on to the floor round the platform from which they were watching.

STEEL PRODUCTION in the United States this year should be in the region of 100,000,000 tons, compared with 99,300,000 tons in 1959, according to Mr. Russell Peters, vice-president of the Inland Steel Company. He said he looked for a gradual but unspectacular improvement in the industry as the year progressed.

THE DESIGN, fabrication, and complete erection of the installation of new head gear at the coal and man winding upcast shaft at Lady Windsor Colliery, Ynysybel, near Cardiff, reference to which was made in last week's issue, was carried out exclusively by Naylor Bros., Limited, mining engineers, of Golborne (Lancs).

PLANT AND EQUIPMENT for the production of improved ferro alloy briquettes has been installed at the Glossop works of the alloys division of Union Carbide, Limited. As from Monday, briquettes will be marketed in a new shape with new improved packaging, and at a considerably reduced price, states the division.

TO SERVE the interests of clients in Scotland and northern England, W. J. Jenkins & Company, Limited, materials handling engineers, of Retford (Notts), have opened an office at Exchange Buildings, Quayside, Newcastle-upon-Tyne (telephone: Newcastle-upon-Tyne 25736). The office is managed by Mr. L. Coleyshaw.

NEW British chemical, meta-tertiary butyl phenol, has been developed by Coalite & Chemical Products, Limited, Chesterfield. It is now available in pilot plant quantities for evaluation both in the pure form and as a mixture of meta and para tertiary butyl phenol. This new product is expected to prove a most useful development chemical for use in coating and adhesive resins, antioxidants, lube oil additives, anti-skinning agents, and oil demulsifiers.

THE Bromford Iron & Steel Company, Limited, West Bromwich (Staffs), announces that exports of cold and hot rolled steel for December, 1960, were worth nearly £30,000. This figure included orders from Australia, Canada, New Zealand, India, Denmark, Iceland, and Portugal. In the past few months Bromford has in addition exported to Hongkong, Greece, East Germany, Holland, Sweden, Finland, Switzerland, Czechoslovakia, Pakistan, and the Middle East.

THE Shipbuilding Employers' Federation and the Confederation of Shipbuilding and Engineering Unions met on Wednesday and had a useful and exploratory talk on the competitive position of the shipbuilding and shiprepairing industry. A joint statement issued after the meeting made it clear that there is a desire on both sides to continue these discussions in the spirit of helpfulness and goodwill which characterized the discussions. A further meeting will be held on March 29.

WHAT IS BELIEVED to be one of the largest and most valuable collections of machine tools acquired in a single private transaction since the war, has been bought by W. E. Norton (Machine Tools), Limited, London, S.W.1. The purchase price was not revealed, but the replacement value is around £250,000. The machines include many multiple- and single-spindle automatics which have become redundant due to reorganization in a leading concern of electronic engineers.

NEW COMPANY is being formed by Conveyancer Fork Trucks, Limited, material equipment handling manufacturers, of Warrington, in association with the Raymond Corporation, of the US. To be known as Conveyancer-Raymond, Limited, the company will manufacture and distribute in the UK and other markets the Raymond range of equipment. Conveyancer Raymond will be an associate of Electro-Hydraulics, which is a subsidiary of Rubery Owen & Company, Limited. The board will be Mr. A. G. B. Owen, chairman, Mr. C. W. Sharp, managing director, Mr. George G. Raymond, and Mr. L. Rumley.

Exports of British Coal

DETAILS of British coal exports and bunker shipments in January, 1961, and their values, and corresponding figures for January, 1960, are given below.

	Month ended January 31.		Month ended January 31.	
	1960.	1961.	1960.	1961.
Categories	Tons.	Tons.	£	£
Anthracite—				
Large	7,371	7,094	60,911	57,390
Graded	20,622	25,292	171,625	215,131
Cleaned smalls	23,795	27,923	77,403	89,595
All other	35,112	33,015	173,872	165,352
Steam coal (including household)—				
Large	80,892	64,600	371,628	299,498
Graded	54,864	31,578	244,109	135,495
Cleaned smalls	95,338	119,302	207,966	270,033
Untreated smalls	97,388	108,783	260,312	285,915
Other	26,833	12,927	83,404	42,071
Gas coal—				
Unscreened	30,696	20,889	133,286	83,563
Graded	43,027	43,597	188,170	177,350
All other	9,427	2,916	42,210	13,084
Coking coal	14,186	13,413	62,447	53,404
TOTAL	539,551	511,329	2,077,343	1,887,881
Destinations				
Other Commonwealth countries	319	7	2,086	147
Eire	137,997	105,685	591,669	441,980
Finland	5,707	3,324	21,902	12,161
Sweden	24,269	17,799	82,638	62,200
Norway	9,451	9,238	52,405	41,908
Denmark	186,980	155,160	555,013	425,255
Western Germany	44,786	34,216	132,535	92,090
Netherlands	60,400	92,030	237,760	352,214
Belgium	25,170	16,497	129,312	79,017
France	22,817	29,559	149,590	172,958
Portugal	9,289	24,639	50,750	96,708
Italy	8,996	20,243	46,310	84,685
Other foreign countries	3,370	2,932	25,373	26,558
Fuel taken on board vessels engaged in the foreign trade (including fishing vessels) for their own use*—				
British flag	36,635	9,166	—	—
Other flags	4,234	2,521	—	—

* Fuel taken on board vessels for their own use is not shown by value since it is excluded by definition from the export total of the UK

Exports of Coke and Patent Fuel

FIGURES of exports of coke and manufactured fuel from the United Kingdom during January, corresponding figures for January, 1960, and the values of those exports are given below.

Products.	Month ended January 31.		Month ended January 31.	
	1960.	1961.	1960.	1961.
	Tons.	Tons.	£	£
Gas coke	76,408	97,897	481,850	614,049
Hard coke	50,059	39,537	329,244	271,927
Breeze	34,269	24,623	117,219	84,764
Manufactured fuel	22,831	6,969	198,286	64,108
TOTAL	183,567	169,026	1,126,599	1,034,848

Imports and Exports of Mining Machinery

ACCORDING to Board of Trade returns, mining machinery (other than portable power tools) totalling 2,707 cwt. and valued at £120,552 was imported during January. These figures compare with 1,715 cwt. and £70,390 in the same month of 1960.

The appended table contains figures of export quantities and values of mining and well-drilling machinery in January, compared with those for the corresponding month of 1960.

Destination.	Month ended January 31.		Month ended January 31.	
	1960.	1961.	1960.	1961.
	Cwt.	Cwt.	£	£
Union of South Africa	5,144	1,194	110,396	38,345
India	5,122	3,501	111,302	78,640
Australia	595	2,597	13,856	34,882
Canada	1,634	1,497	37,404	38,308
Trinidad	507	792	20,463	22,928
Other Commonwealth countries and Eire	4,196	4,782	126,221	146,528
Argentina	4,944	148	185,587	5,658
Other foreign countries	9,204	11,239	287,205	419,939
TOTALS				
Well-drilling machinery—				
Petroleum	9,688	6,518	362,856	276,252
Other	1,035	2,260	38,850	59,458
Mining machinery (excluding portable power tools)—				
Coal-cutters, power operated—				
Complete	3,263	1,633	114,573	74,374
Parts	1,373	1,889	70,823	73,668
Conveyors, underground—				
Complete and parts	6,924	5,789	78,725	93,402
Winders, power operated—				
Complete and parts	3,629	1,244	76,108	37,315
All other	5,434	6,417	150,499	170,759
TOTAL	31,346	25,750	892,434	785,228

FALL IN EUROPEAN COAL PRODUCTION

PRODUCTION of hard coal in Europe (excluding Russia) totalled 590,000,000 tons last year—7,000,000 tons less than in 1959, according to figures issued by the Economic Commission for Europe. It was the third successive decrease in European output, the heaviest fall being in Britain which last year produced 12,700,000 tons less than in 1959.

The demand for coal in Europe improved, and unsold pithead stocks fell from 67,000,000 tons to 58,000,000 tons during the year. In the Soviet Union output of hard coal and lignite rose 6,500,000 tons to a new record of 513,000,000 tons last year.

NEW METHODS of transporting solid fuel by pipeline and new types of electric power transmission are to be investigated at a new £1,500,000 laboratory, which the Central Electricity Generating Board expects to set up later this year close to the Marchwood (Hants) power station. This new laboratory, for which planning permission has yet to be granted, will also study increasing operational efficiency of new coal-burning stations.

Orders Placed

WIRE, CABLE, AND MACHINERY, worth £100,000, has been ordered by India from Wandleside Cable Works, Limited.

TRANSFORMERS, worth about £250,000, have been ordered from Johnson & Phillips, Limited, by the Central Electricity Generating Board.

FURTHER ORDER for lathes valued at more than £45,000 has been placed with T. S. Harrison & Sons, Limited, Heckmondwike (Yorks), by US Industries, Inc. (Great Britain), Limited.

TEST SET voltage detector of a special nature is to be designed and developed by Avo, Limited, a member of the Metal Industries, Limited, group, under a contract from the Ministry of Aviation.

AN £18,000 CONTRACT has been awarded to Wm. Boby & Company, Limited, water treatment engineers, of Rickmansworth (Herts), by Monsanto Chemicals, Limited, for the supply of a de-aeration plant to its Ruabon (North Wales) factory.

DURING the past six months Ferranti, Limited, has received orders worth £350,000 for machine tool control systems and inspection machines from companies in the US, Europe, and the UK. Over 50 per cent. of the equipment was sold in the US.

MEMBER of the Hawker Siddeley, Limited, group, Petters, Limited, Staines, is to supply 500 PC 1 diesel engines worth £30,000 to Preco, Inc., Los Angeles, US, for use as power units in a new rail refrigerator wagon temperature control system.

CONSIGNMENT OF MACHINERY and plant to the value of £750,000 is being shipped to the USSR by Sterling Moulding Materials, Limited, Stalybridge (Ches). The equipment will be installed in Russia's first factory for the production of polystyrene moulding powders.

EXTENSION to the existing contract with the Guest Keen Iron & Steel Company, Limited, has been awarded to Tarmac Civil Engineering, Limited, a member of the Tarmac, Limited, group. The additional contract is for building and civil engineering work in the blast furnace area and is worth £190,000.

MACHINERY worth about £60,000 has been ordered by Czechoslovakia from the Bronx Engineering Company, Limited, Lye (Worcs). It includes a press brake, a mill for making hoes, spades, and shovels, a process levelling machine for processing sheet steel before deep drawing, and a large tube straightening machine.

REPEAT ORDERS from two power stations for diesel generating plant have been placed with Mirrlees, Bickerton & Day, Limited, a member of the Hawker Siddeley Industries Group, Limited. The first is for a Mirrlees diesel for the Ashanti Goldfields Corporation and the second for a similar engine for the Douglas Electricity Company, Limited.

CANADIAN ORDER for 1,600 electric motors worth $100,000 has been delivered in three weeks by Newman Industries, Limited, Bristol. The West Pakistan Water and Power Development Authority has also set a four-week delivery period on an order for 198 vertical hollow-shaft motors, worth $53,000, which it has recently ordered from the company.

HEAVY PRESS, capable of exerting a thrust of 3,000 tons, has been supplied by Head Wrightson Teesdale, Limited, a member of the Head Wrightson & Company, Limited, group, to the de Havilland Aircraft Company, Limited. The press is designed for the Redux process of metal to metal bonding by adhesion under temperature and pressure control. The order is worth £60,000.

CONTRACT for grouting below the cut-off of the projected Derwent reservoir near Edmonbyers (Co. Durham) has been awarded to the Cementation Company, Limited. Work on the grouting, which is expected to take two years to complete, will start about July. Cementation will undertake 66,800 ft. of drilling and grouting. The average depth of drilling below the cut-off will be 125 ft., and the trench itself will have a maximum depth of 200 ft.

Appointments

Mr. R. Talbot Transfers to Warwickshire NCB

ON Monday, Mr. R. Talbot takes up his new appointment as deputy area production manager (planning) of the Warwickshire Area of the West Midlands Divisional Coal Board. For the past four years he has held a similar post in the Wigan Area of the North-Western Division, before which he was the Wigan Area production engineer for six years.

Mr. Talbot's earlier experience was gained in the Lancashire coalfield, including 14 years with Manchester Collieries, Limited, first as a surveyor and then for five years as group planner. On nationalization he became Area chief planner in the North-Western Division's No. 1 Area. From 1948, to 1951, when he returned to the North-Western Division as Area planning engineer, he was Area planning and development engineer in the No. 2 Area of the Northern (N&C) Division.

Former senior sales engineer for industrial gas turbine control systems of Lucas Industrial Equipment, Limited, Mr. ALAN THRELFALL has been appointed sales manager of Perkins Gas Turbines, Limited.

Firth Cleveland, Limited, group has appointed Mr. GRAHAM COOKE as group publicity director to head a new division which will co-ordinate and control advertising and public relations for the group and all its member companies.

Maj. F. D. OUTRIDGE has been appointed assistant to Capt. R. A. Villiers, director of the Scientific Instrument Manufacturers' Association. He will be particularly responsible for publicity and exhibitions in the UK and oversea.

Mr. DAVID E. PYRAH, chief assistant to the civil engineer, No. 3 Area of the North-Eastern Divisional Coal Board, has been appointed resident engineer on the new Darley Dale sewerage scheme at Matlock (Derbyshire). He has been with the NCB since 1956.

Mr. G. WEBB has been appointed manager of the contracts and sales department of Erskine, Heap & Company, Limited, switchgear and motor control gear manufacturers, of Manchester, in succession to Mr. W. Briggs, who has retired from that post and from the board after 50 years with the company.

Mr. ERIC WOOD has been appointed home sales manager of Robert Hudson, Limited, iron and steel founders, etc., of Leeds. He was formerly sales consultant to a group of companies within the Rank Organization. Prior to that Mr. Wood spent 10 years as general sales manager of Ross Bros., Limited, precision engineers.

Rectifier engineering and semiconductor engineering departments of the heavy plant division of Associated Electrical Industries, Limited, have combined to form the power rectifier engineering department. Dr. J. C. READ, manager, rectifier engineering department since 1949, becomes divisional consultant—rectifiers, and Mr. W. D. SINCLAIR has been appointed manager of the new department.

Imports and Exports of Iron and Steel

FIGURES of imports and exports of iron and steel in January (in terms of tonnage and value), based on Board of Trade returns, are given in the following tables. Details for January, 1960, are also included.

Total Exports of Iron and Steel

Destination.	Month ended January 31.		Month ended January 31.	
	1960.	1961.	1960.	1961.
	Tons.	Tons.	£	£
Malta	1,220	319	70,871	25,395
Sierra Leone	419	2,244	40,704	135,826
Ghana	2,108	1,833	107,154	104,729
Nigeria	6,186	11,315	416,211	605,774
Union of South Africa	7,013	5,474	600,457	495,061
South-West Africa	106	2,711	6,939	219,784
Rhodesia and Nyasaland	1,506	3,494	107,689	217,037
Tanganyika	652	2,647	47,467	143,388
Kenya	2,036	4,404	116,863	250,398
Uganda	161	420	12,881	44,624
Mauritius	305	239	15,492	16,771
Bahrein, Qatar, and Trucial States	162	1,502	13,955	114,247
Kuwait	120	697	19,530	71,478
India	15,132	20,039	1,009,009	1,289,395
Pakistan	7,725	4,232	265,610	257,541
Singapore	1,970	2,051	150,444	156,385
Malaya	1,431	2,463	99,234	186,182
Ceylon	4,995	2,675	264,214	175,317
British North Borneo	322	316	17,329	18,948
Hongkong	6,363	5,553	241,347	238,688
Australia	13,743	24,113	1,062,391	1,703,701
New Zealand	7,538	26,013	504,049	1,492,391
Canada	23,148	12,688	1,364,933	879,456
Jamaica	1,890	2,035	142,731	130,620
Trinidad	4,376	3,533	365,205	268,791
British Guiana	533	688	34,608	51,501
Other Commonwealth countries	1,866	1,818	126,959	128,339
Eire	4,283	7,309	276,419	441,738
Soviet Union	2,214	1,572	982,591	411,604
Finland	3,047	3,619	252,935	313,521
Sweden	24,068	16,808	1,258,798	1,094,042
Norway	12,766	9,925	705,843	583,934
Denmark	9,367	7,556	619,854	538,994
Poland	1,580	276	135,194	40,626
Western Germany	19,543	6,840	857,691	347,275
Eastern Germany	6,083	1,870	317,006	149,826
Netherlands	11,093	8,880	637,894	579,181
Belgium	4,658	610	261,598	73,231
France	369	1,269	49,843	147,261
Switzerland	1,289	2,028	149,122	218,742
Portugal	1,139	1,351	92,399	119,305
Spain	1,142	1,921	115,122	144,250
Italy	4,605	4,772	227,516	370,773
Austria	462	651	80,417	93,083
Yugoslavia	168	4,110	7,421	170,985
Greece	1,723	3,879	81,880	197,101
Turkey	183	2,045	14,528	166,438
Netherlands Antilles	836	51	38,864	4,610
Portuguese East Africa	556	229	33,470	16,256
Egypt	1,366	4,228	62,783	200,594
Libya	1,204	683	95,103	61,309
Sudan	454	1,270	33,575	98,528
Israel	3,287	3,011	165,154	174,337
Saudi Arabia	25	177	3,422	27,752
Iraq	3,232	12,806	236,975	926,653
Iran	7,476	2,210	467,257	170,120
Burma	90	245	6,359	19,318
Thailand	1,710	771	125,956	42,325
Indonesia	2,681	1,301	207,692	93,934
China	7,451	2,899	633,465	380,825
Japan	8,608	13,292	179,181	335,062
Philippine Republic	1,647	780	113,362	43,415
USA	30,672	7,476	1,961,209	533,407
Cuba	970	234	76,956	16,007
Mexico	562	146	49,882	35,692
Colombia	790	2,012	53,433	120,644
Venezuela	4,002	1,822	307,580	145,104
Ecuador	125	207	9,957	16,849
Peru	449	804	32,741	61,515
Chile	175	316	15,324	40,116
Brazil	2,439	426	178,102	37,861
Uruguay	840	274	62,616	18,979
Argentina	10,176	5,797	649,076	438,589
Other foreign countries	5,716	3,921	472,305	321,718
TOTAL	320,347	300,195	20,620,146	20,005,196

Total Imports of Iron and Steel

From	Month ended January 31.		Month ended January 31.	
	1960.	1961.	1960.	1961.
	Tons.	Tons.	£	£
Union of South Africa	3,593	2,370	216,645	134,356
Rhodesia and Nyasaland	995	6,353	123,093	298,943
Canada	3,438	23,859	243,872	1,056,762
Other Commonwealth countries and Eire	4,306	5,124	228,255	187,605
Soviet Union	4,428	3,555	122,929	101,335
Sweden	2,810	4,296	391,509	635,929
Norway	8,785	11,655	560,804	633,954
Poland	86	141	4,815	19,746
Western Germany	14,536	6,036	1,012,016	426,986
Netherlands	16,008	7,165	1,057,434	455,335
Belgium	4,573	4,645	332,016	206,874
Luxembourg	645	2,959	35,926	123,890
France	4,036	2,847	341,187	280,955
Italy	1,060	154	72,946	37,494
Austria	583	302	50,909	39,205
Japan	424	1,032	41,248	184,841
USA	2,293	1,721	256,979	392,570
Other foreign countries	869	714	55,151	61,612
TOTAL	73,468	84,928	5,147,725	5,278,392
Iron and steel scrap and waste, fit only for the recovery of metal	5,899	1,625	94,384	36,028

Exports of Iron and Steel by Product

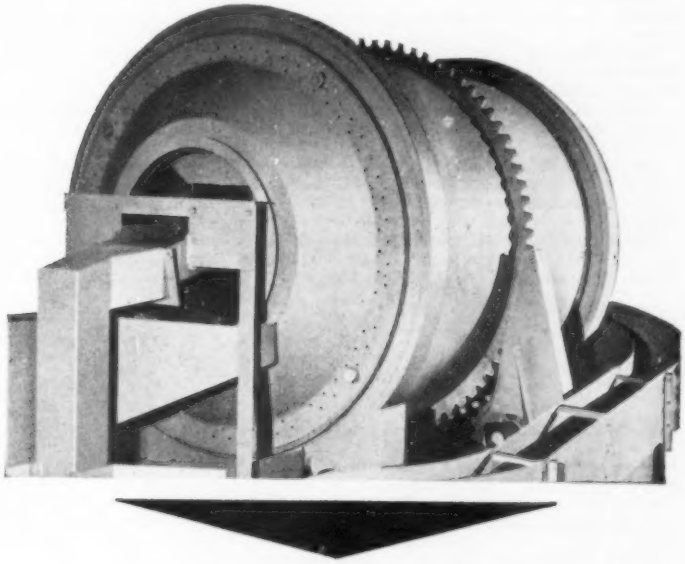
Product.	Month ended January 31.		Month ended January 31.	
	1960.	1961.	1960.	1961.
	Tons.	Tons.	£	£
Pig-iron	25,747	7,703	483,240	162,889
Ferro-columbium (niobium)	14	5	20,340	9,023
Ferro-tungsten	107	85	45,621	34,988
Other ferro-alloys	676	294	129,747	67,753
Ingots, blooms, billets, slabs, steel bars (incl. tinplate bars), and similar primary forms	5,562	1,108	191,095	43,094
Pieces roughly shaped by forging	45	200	6,355	20,847
Iron bars, rods, angles, shapes, and sections	208	264	10,503	13,513
Steel bars, rods, angles, sections, and shapes	60,636	65,416	2,991,900	3,485,515
Iron plates and sheets	36	149	2,624	7,503
Universal plates	1,848	715	86,169	33,842
Steel plates, 3mm. and under 4.5mm. in thickness	2,436	2,955	148,912	166,414
Ditto, 4.5mm. or more in thickness	24,391	35,883	1,148,382	1,526,063
Blacksheets and blackplate	29,456	24,659	2,212,787	1,863,417
Hoop and strip	7,644	11,485	641,914	1,058,054
Tinplate	57,648	33,289	4,365,931	2,558,365
Decorated tinplate	244	573	20,699	44,453
Galvanized sheets	5,245	5,613	381,978	433,179
Other (incl. tinned sheets, terneplate, and ternesheets)	4,195	4,354	333,740	490,788
Railway and tramway construction material	8,654	23,745	453,020	1,092,240
Wire rods of steel (incl. alloy steel)	6,984	3,892	322,744	185,938
Wire	9,708	10,852	838,449	950,646
Tubes, pipes, and fittings	68,863	66,956	5,785,996	5,756,642
TOTAL	320,347	300,195	20,620,146	20,005,196

NET PROFIT of Kr. 11,700,000 was made in 1960 by Atlas Copco, AB, Stockholm, against Kr. 8,100,000 in 1959, after tax of Kr. 11,800,000 (Kr. 10,900,000). A dividend of Kr. 3 per share (2.5 plus 0.5) is recommended on the increased share capital.

clean coal

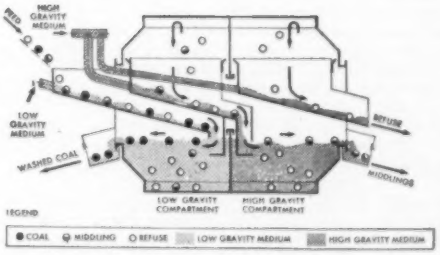
middlings

refuse



from ONE vessel

The WEMCO Two-Compartment Drum Separator is a single, slowly rotating vessel containing two individual heavy medium pools of different, and adjustable, specific gravities. The low gravity medium in one compartment separates a primary float product, the sink material being lifted and sluiced into the second compartment where middlings and true sinks are separated. With their associated equipment, these robust, hard-wearing units can be used to extend existing plants, or as part of new installations.



Other WEMCO equipment:
DMS laboratory units.
Coal spirals. Froth flotation cells.
Densifiers and thickeners.

WEMCO®

DRUM SEPARATORS

WEST'S (MANCHESTER) LIMITED

NORTON STREET · MILES PLATTING · MANCHESTER 10
Tel.: COLlyhurst 1952/3 Telegrams: Westman Manchester 10
London: Columbia House, Aldwych, W.C.2. Tel.: HOLborn 4108
CL22

CURRENT PRICES OF IRON AND STEEL

(Delivered, unless otherwise stated)
March 2, 1961

PIG-IRON

Foundry and Forge Iron.—No. 3 iron, Class 2, Middlesbrough, £21 17s.; Birmingham, £21 9s. 3d., 10-ton lots or over.

***Low-phosphorus Iron.**—Over 0·10% to 0·40% P, 10-ton lots or over, £23 5s., delivered Birmingham, £23 10s., delivered Grangemouth.

***Basic Pig-iron.**—Delivered in Staffs, Derbyshire, Notts, Lincs, Rutland, Northants, and Leics, 10-ton lots or over, £20 3s.

Hematite.—Si less than 2%, S & P 0·03-0·05%, 10-ton lots or over; N.-E. (local iron), £23 19s.; Scotland (Scotch iron), Zone S.1, £24 5s. 6d.; Sheffield, £25 9s.; Birmingham, £25 13s.; Wales (Welsh iron), £23 19s.

Refined.—Cylinder and refined irons, South Zone, £25 9s., North Zone, £25 6s. 6d. Refined malleable, max. 0·10% P, South Zone £26 9s., North Zone £26 6s. 6d.

MANUFACTURED IRON

(Bar basis, 2⅜ in. to ¾ in.)

CROWN IRON: England and Wales (Zone 1), £50; Scotland, £49 15s.; Ireland, f.o.q. Belfast, £53; all other Northern Ireland ports, £54, f.o.q. Cable iron, £1 extra.

SEMI-FINISHED STEEL

Re-rolling Billets, Blooms, and Slabs.—BASIC: Soft, u.t., 100 tons and over, £31 15s. 6d.; tested, 0·08-0·33% C, 100 tons and over, £32 5s. 6d.; hard (0·41-0·60% C), 50 tons and over, £33 17s.; silico-manganese, 50 tons and over, £42 16s. 6d.; free-cutting steel up to 0·25% C, 50 tons and over, £35 4s. 6d. SIEMENS-MARTIN ACID (50 tons and over): Up to 0·25% C, £40 11s.; silico-manganese, £43 4s.

Billets, Blooms, and Slabs for Forging and Stamping.—Lots of 50 tons and over. Basic, soft, up to 0·33% C, £37; basic, hard, over 0·41 up to 0·60% C, £38 2s. 6d.; acid, up to 0·25% C, £41 14s.; acid silico-manganese, £44 17s.

Alloy Steel (25 tons and over).—BILLETS, 3 in., up to and including 10 in., for re-rolling, 0·6/1% Ni, £46; Ni 2·75/3·75%, Cr 0·5/1·10%, £72 17s.; Ni 2·75/3·75%, Cr 0·5/1·3%, Mo. 0·2/0·65%, £83 7s. BARS: 1 in. dia. and up, nickel, £66 7s.; nickel-chrome, £97 1s.; nickel-chrome-molybdenum, £109 14s.

Other Semi-products, etc.—Forging ingots, up to 0·60% C, £31 12s. 6d. f.o.t.; tube billets, 50 tons and over, £39 10s.; shell steel billets for direct forging, up to and including 0·33% C, 100 tons and over, £37 15s.; tin bars and sheet bars, 50 tons and over, £32 10s. Wire rods, 3g. to 4g. (all areas except Birmingham, Scotland, Southern Joint Area, and Northern Ireland): Soft basic, 50 tons and over £39 17s.; hard basic, 50 tons and over, £43 8s.; free-cutting, up to 0·25% C, 50 tons and over, £45; acid, up to 0·75% C, 50 tons and over, £54 6s. 6d. Stainless steel billets, 3 in. and larger, 10 tons and over, Austenitic, £219 10s.; martensitic, £131 10s.

FINISHED STEEL

Heavy Products (50 tons and over).—Mild-steel plates, ordinary qualities, N.-E. Coast and Northern Joint Areas and Central Scotland, £40 7s.; medium plates, all areas of England and Wales, £43 16s. 6d.; boiler plates, N.-E. Coast and Northern Joint Areas and Central Scotland, £42 17s.; floor plates, N.-E. Coast, £41 16s. Sections (N.-E. Coast, Midland, and Northern Joint Areas, and Central Scotland): Angles, £38 1s. 6d.; bars (rounds and squares), £40 11s. 6d.; flats, £38 6s. 6d.; joists, £37 17s. 6d.

Rolled and Re-rolled Steel Products.—N.-E. Coast, Midland, Northern Joint, and South Wales Areas, and Central Scotland, 50 tons and over: Angles and tees, 4 in. and under, £40 18s. Channels, 3-in. web and under, £40 18s. Flats, 5 in. wide and under, and rounds and squares, under 3 in.: Untested soft basic, £39 1s.; free-cutting, £44 9s. 6d.; hard basic, £41 19s. 6d.; Siemens-Martin acid, £49 12s. 6d.; spring steel, basic, £44 4s. 6d.; spring steel, acid, £53 11s. Glazing tees, £47 0s. 6d. Sash and casement sections, £43 13s. 6d. Gate channels, £50 17s. 6d. Ferro-concrete bars (10 tons to under 500 tons), £39 10s.

Sheets and Strip.—Uncoated strip mill coils, hot rolled, under 3 mm. to 12g., mill run, mill edge, 25 tons to under 50 tons, £43 16s.; cold reduced, 17/20g., side trimmed, skin passed, £49 16s. Black sheets, 24g., 10 tons and over, £57 14s. 6d.; galvanized corrugated sheets, 24g., 10 tons and over, £67 11s. Cold-rolled steel strip, coils, hard temper, not annealed, 20 tons and over, £54 5s. Hot-rolled hoop and strip, u/t soft basic, 100 tons and over, £38.

Tinplates.—Cold reduced, hot dipped, 15 tons to under 50 tons, 66s. 8d. per basis box of 108 lb., f.o.t., makers' works. Cold reduced electrolytic, 59s. 9d. per basis box.

Colliery Rails and Arches.—Arches, 4 in. × 2½ in. × 2 in., re-rolled, £38 15s.; 3 in. × 3 in., re-rolled, £39; 3½ in. × 3½ in., re-rolled, £40 7s. 6d.; 4 in. × 2½ in. × 2 in., prime £43 7s. 6d. Other sections, prime, £43 12s. 6d. Extra fish-plates, £52 10s. Cambered girders, 4 in. × 2½ in. × 2 in., re-rolled, £37 9s.; 3 in. × 3 in., re-rolled, £37 11s. 6d.; 3½ in. × 3½ in., re-rolled, £38 18s. 6d.; 4 in. × 2½ in. × 2 in., prime, £42 4s. 6d. Other sections, prime, £42 7s. Benk bars, standard type, prime material, all thicknesses, £38 11s. "W" type bars, prime steel, all thicknesses, £41 1s. Standard type, re-rolled, up to ⅜ in., inclusive, £36 3s. 6d.; over ⅜ in. to ½ in., inclusive, £37 8s. 9d. "W" type bars, re-rolled, up to ⅜ in., inclusive, £38 13s. 6d.; over ⅜ in. to ½ in., inclusive, £39 18s. 6d. Light rails, flange, 25 lb. and under, prime, £40 17s. 6d. Flange rails, 25 lb. and under, re-rolled, £39 15s. Fishplates, £50 12s. 6d.

Bright Steel (50 tons and over).—Bars, no analysis or test, £53 5s.; flats, untested, £70 16s. 6d.

High-speed Tool Steel.—Finished bars, 5% cobalt, 10s. 10d.; 14% tungsten, 6s. 11d.; 18% tungsten, 7s. 9d.; 22% tungsten, 9s. 2d.; 4/6 quality molybdenum tungsten, 6s. 3d.; 6/6 quality molybdenum tungsten, 6s. 5d.; 5/6/2 quality molybdenum tungsten vanadium, 6s. 7d. per lb.

Rails, etc.—F.B. rails, heavy 75 lb. to under 90 lb., 500 tons and over, f.o.t., £39 15s.; fishplates for rails 80 lb. and heavier, 50 tons and over, f.o.t., £55 11s.; soleplates, f.o.t., 100 tons and over, £51. Light flange rails, 25 lb. and under, d/d N.-E. Coast, Midland, Northern Joint, and South Wales Areas, and Central Scotland, 50 tons and over, £40 17s. 6d.; fishplates for light rails, 50 tons and over £50 12s. 6d.

BLAST-FURNACE COKE

(F.O.T. at Ovens)

DURHAM AND NORTH-EAST COAST: 177s. 6d. SOUTH WALES: 174s. 7d. NOTTS AND DERBY: 150s. 7d. LANCASHIRE: 162s. 7d. STAFFORDSHIRE: 156s. 2d. YORKSHIRE: 155s. 1d. SCOTLAND: 187s. 11d.

(All prices are subject to quality differentials.)

STEELWORKS SCRAP

(Plus 5 per cent. in the case of sales by merchants.)

	Scotland.	N.-E. Coast.	Midlands.	Sheffield.	Lancs.	S. Wales (East)	S. Wales (West)
	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.	s. d.
Heavy steel scrap*	229 3	228 3	220 0	226 3	226 3	227 3	232 3
Heavy mixed scrap*	207 3	206 3	198 6	204 3	203 9	205 3	210 3
Heavy steel turnings† ..	179 9	179 0	169 9	176 9	174 3	177 0	180 0
Heavy cast iron†	206 9	203 9	208 0	204 3	189 3	199 3	205 9
Cast-iron borings†	160 3	157 3	157 0	159 9	157 3	159 6	164 6

* Not less than 500 tons delivered within three months.

† Not less than 250 tons delivered within three months.

Electrical Aids in Industry *Data Sheet* **No. 16**

Speed control of Electric Motors

'Variable' speed may involve two or three (or more) speed steps or infinitely variable (stepless) speed control. It is this latter type which is considered below. Of the many advantages of electric drives, the opportunity offered for infinitely variable speed control is outstanding. Unfortunately this advantage is not used as much as it might be.

Principal Factors Affecting Choice of Drive

(a) First cost, (b) Efficiency, (c) Speed range, (d) Regulation, (e) Power-to-weight ratio, (f) Availability of supply, (g) Maintenance and reliability, (h) Change in power and torque over the speed range, (i) Simplicity of control gear, (j) Effect of variation in supply, (k) Power factor, (l) Characteristics of the load, (m) Operational environment, (n) Braking requirements.

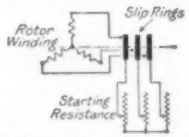
The following are some methods of obtaining infinitely variable speeds:

Alternating Current Motors

The vast majority of electric drives employ A.C. motors. Although not quite so flexible as D.C. motors, there are available many types which give a large measure of speed variation.

INDUCTION MOTORS. Although the squirrel-cage motor is essentially a constant-speed machine, it is much used for stepless variable-speed drives with one of the following types: (a) Eddy-current coupling, (b) Ferro-magnetic particle coupling, (c) Mechanical drives, e.g., belt drives and friction drives, (d) Hydraulic variable-speed drives.

SLIP-RING MOTORS. The slip-ring motor, which costs more than the squirrel-cage motor, can be varied in speed by



means of the resistors in the rotor circuit used for starting. The amount of resistance in circuit can be varied by hand, push-button or automatically controlled contactors.

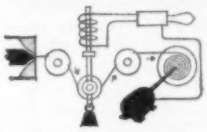
A.C. COMMUTATOR MOTORS. These are three-phase induction motors provided with additional windings which, through a commutator and brushes, permit speed adjustment in either direction below and above synchronous speed. The brush gear can be automatically controlled in such a way as to vary the speed in accordance with a known programme or cycle of operation.

Ward-Leonard System

In this system the armature of a D.C. motor is supplied at variable voltage from a separate generator. The generator may be driven by an A.C. or D.C. motor directly coupled to it and to an exciter which supplies the field windings of the generator and main motor. By means of a potentiometer resistance, the generator voltage may be varied from maximum to zero.

Electronic Motor Control

The speed of motors can be controlled accurately by electronic methods. Such drives can respond in any desired manner to variations, and several drives



can be interlocked so that their speeds are always in the same ratio. The system can be speeded up or slowed down from a 'master' controller, but for 'running in' purposes the speed of each drive can be individually regulated. Electronic speed control has been successfully applied where human control is not possible, e.g., in register control. In this example, print must always be placed at exact position on packaging material.

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The striking advantages of D.C. motors sometimes make it worth while installing a motor-generator set, a mercury-arc or semi-conductor rectifier. The speed of D.C. motors is easily controlled by inserting a resistance in series with the motor. Although this can result in a certain amount of wasted electricity, the benefits derived will often heavily outweigh such losses.

For further information get in touch with your Electricity Board or write direct to the Electrical Development Association, 2 Savoy Hill, London, W.C.2. Telephone: TEMple Bar 9434.

Excellent reference books on electricity and productivity (8/6 each, or 9/- post free) are available—'Electric Motors and Controls' is an example.

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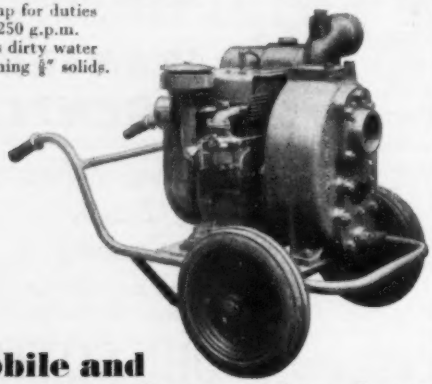

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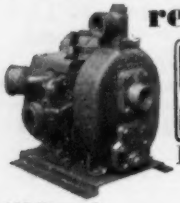

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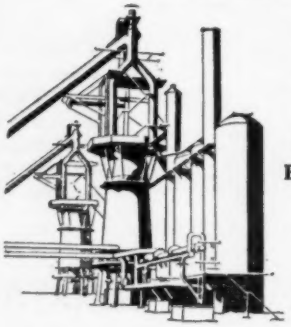

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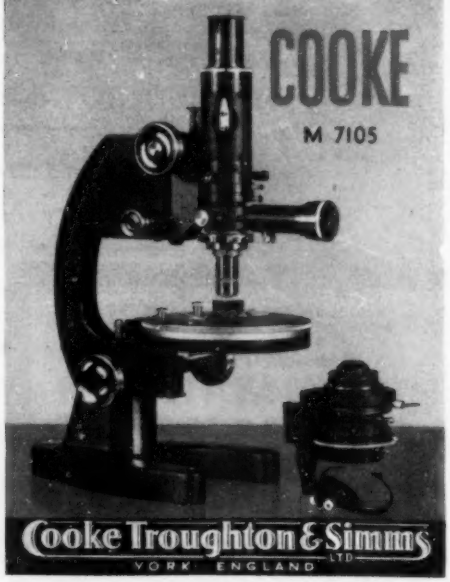

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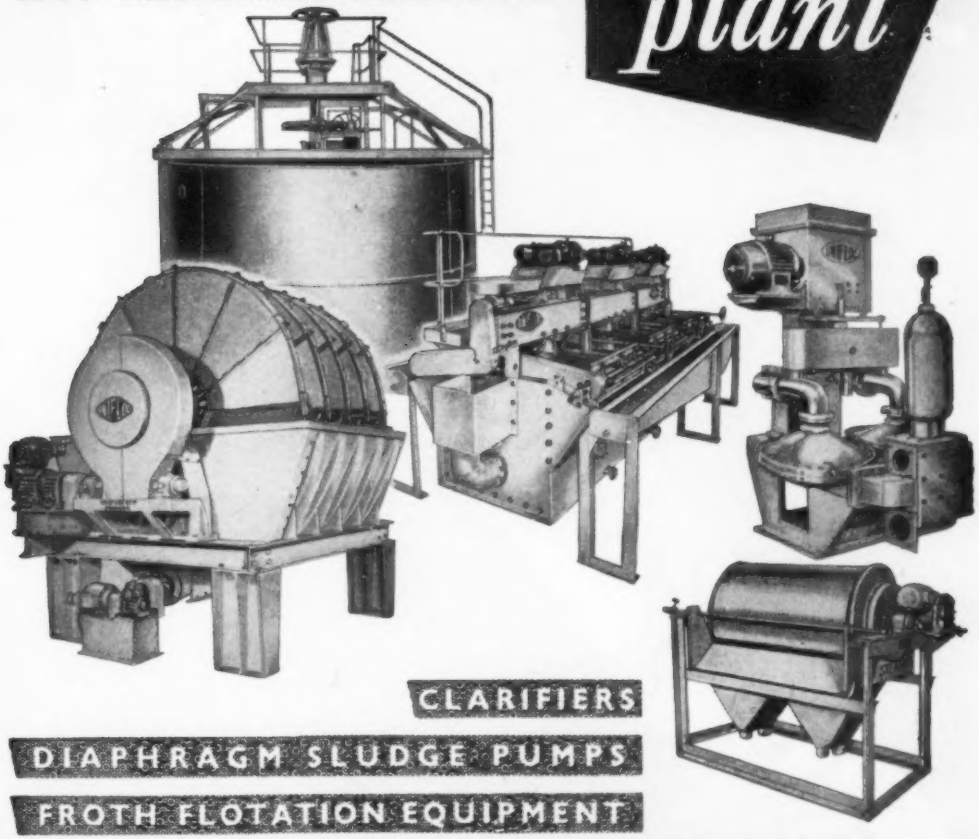

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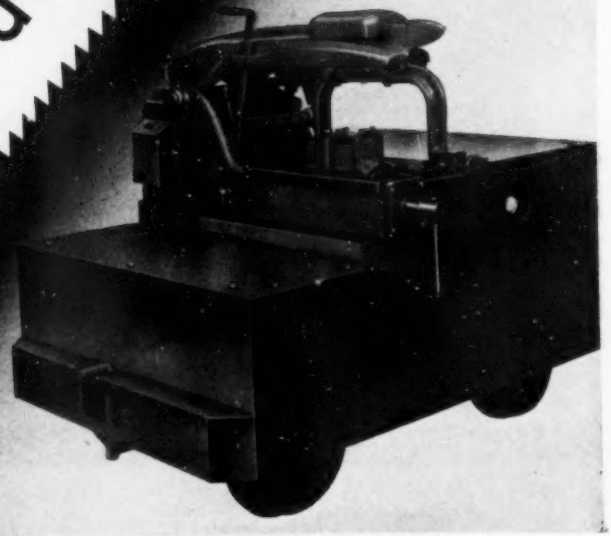

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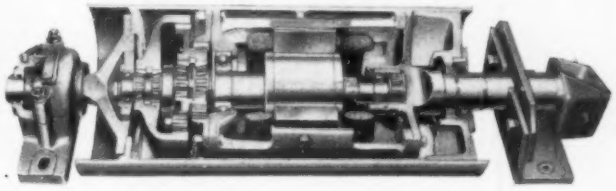

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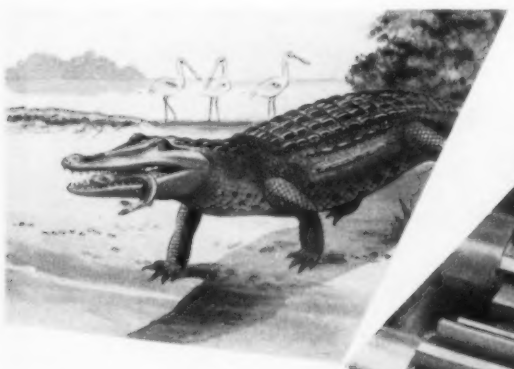

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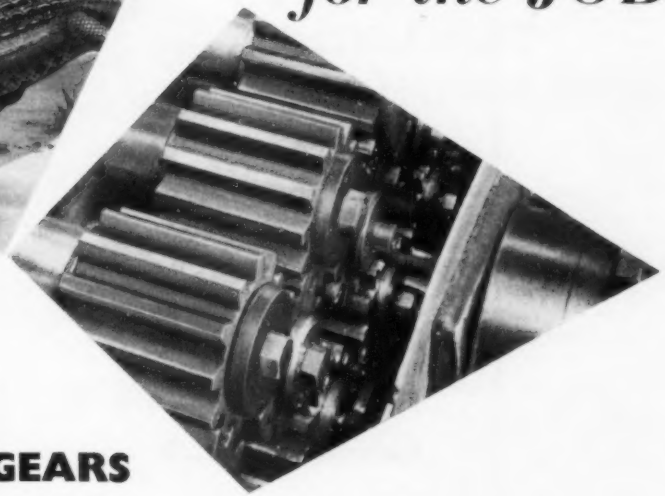

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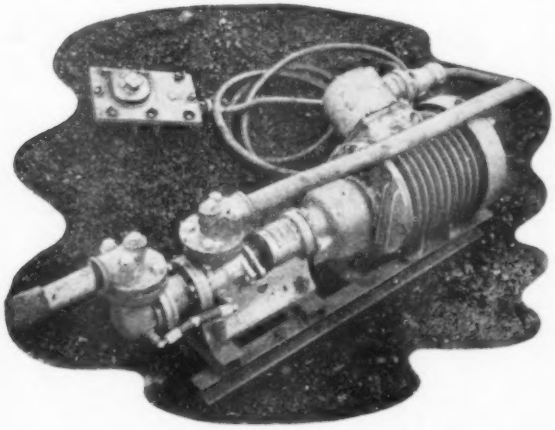

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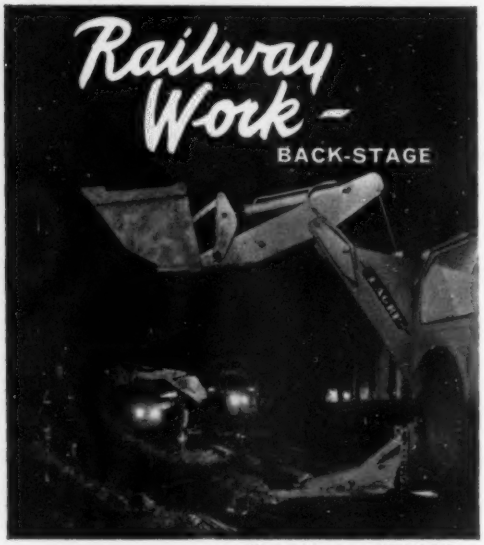

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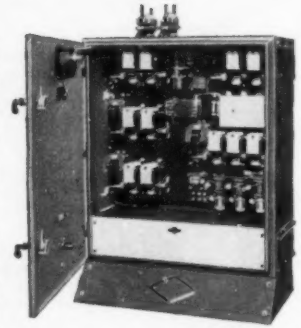

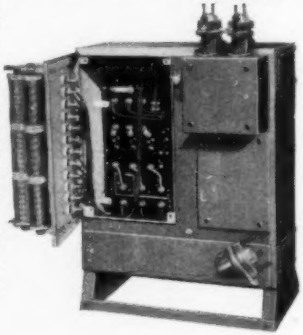

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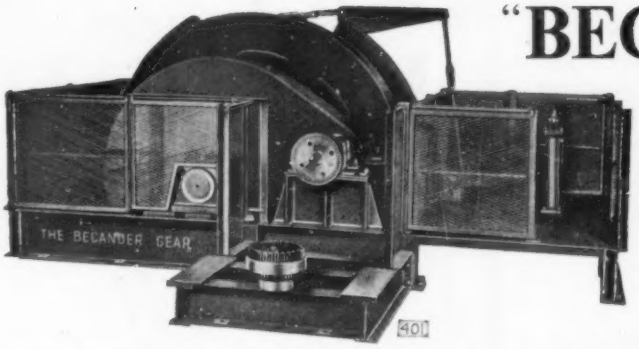

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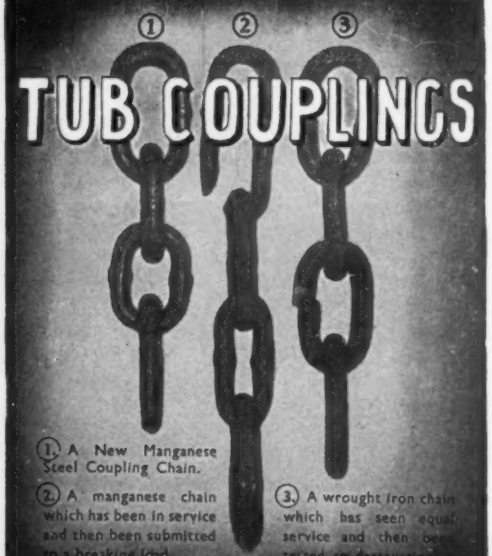

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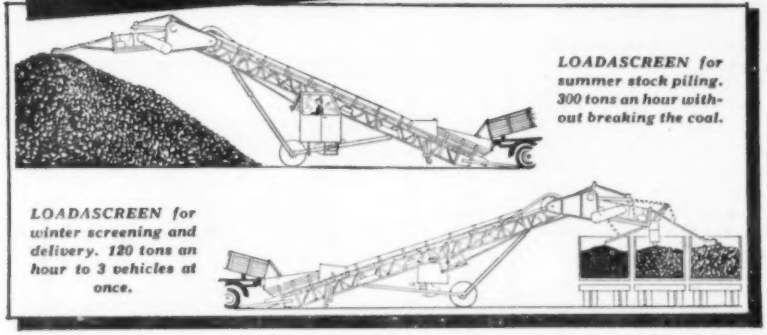

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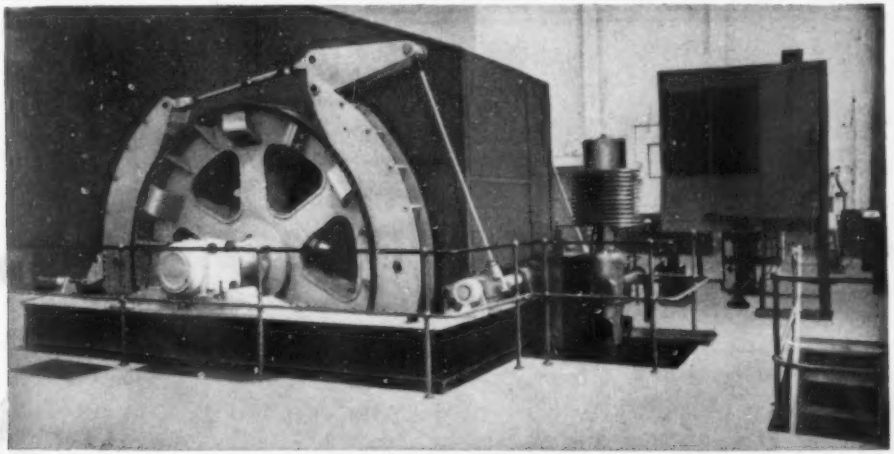

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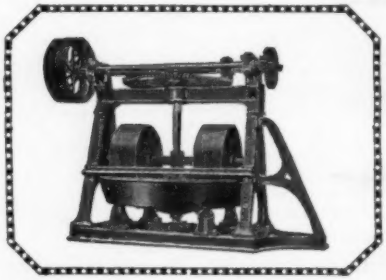

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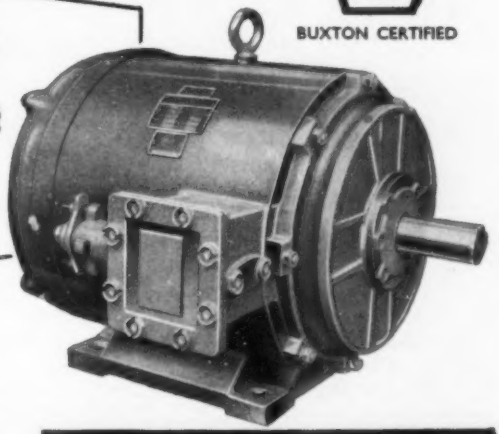

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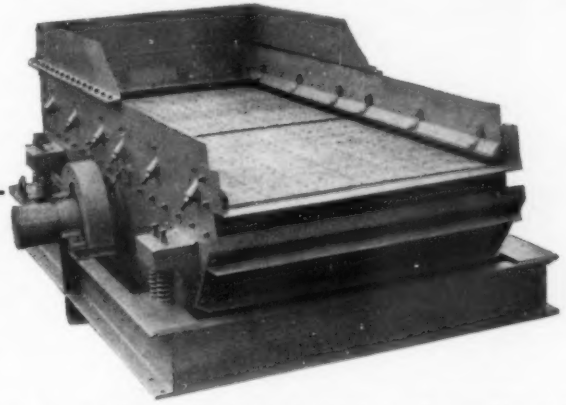

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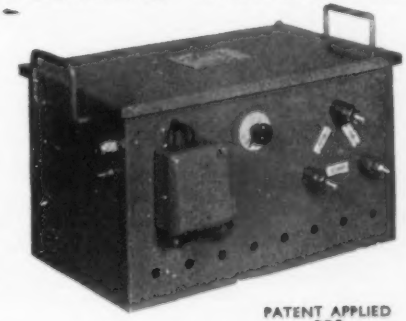

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